

DRAFT



United States Department of the Interior
Bureau of Land Management
Montana State Office



United States Department of Agriculture
Forest Service
Northern Region

March 1997

ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED COOKE CITY AREA MINERAL WITHDRAWAL



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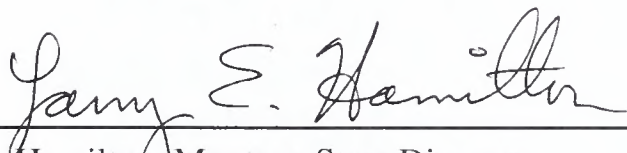
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Prepared by

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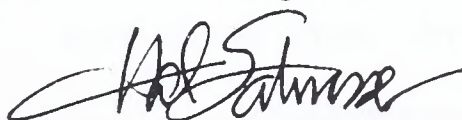
U.S. Department of Agriculture
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March 1997

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March 1997

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COOKE CITY AREA MINERAL WITHDRAWAL DRAFT ENVIRONMENTAL IMPACT STATEMENT

ABSTRACT

Lead Agencies: Bureau of Land Management (BLM), U.S. Department of the Interior; and Forest Service (FS), U.S. Department of Agriculture

Proposed Action: To withdraw from mineral entry federal locatable minerals on up to 22,000 acres near Cooke City in Park County, Montana. Federal hardrock minerals managed as leaseable minerals, and minerals acquired by the United States would also be withdrawn. The withdrawal would be subject to review after 20 years.

Abstract: This EIS analyzes the environmental consequences of two alternatives, i.e. a proposed mineral withdrawal and no mineral withdrawal (No Action). The proposed withdrawal of federal locatable minerals would not allow new mining claims to be filed on federal lands. Unpatented mining claims with valid existing rights and private lands would not be affected. The proposed mineral withdrawal would apply to minerals acquired in the future by the federal government. The proposed mineral withdrawal would also apply to any leaseable hardrock minerals that are acquired by the federal government by purchase or donation. The Gallatin and the Custer National Forest Plans would be amended as needed to be consistent with the terms and conditions of a mineral withdrawal.

Under the "No Action" alternative, federal lands would not be withdrawn from mineral location and entry, i.e., federal lands would be open and available for mineral location and entry under the mining law. This alternative would continue the management that existed prior to September 1, 1995 when the study area was closed to locating new mining claims for a two-year study period known as a segregation. The Custer and Gallatin Forest Plans would not be amended regarding mineral location, entry, or recreational mining.

Following the publication of the final EIS, the BLM State Director with Concurrence of the Regional Forester, Northern Region, will submit a recommendation to the Secretary of the Interior concerning a mineral withdrawal. The Secretary of the Interior will decide what lands to withdraw, if any, and for how long.

A 45 day comment period will be provided for public review of this draft EIS. Comments or questions should be addressed to John Thompson or Larry Timchak, CCAM, P.O. Box 36800, Billings, MT 59107-6800. A phone number where they can be reached is (406) 255-0322.

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LIST OF ACRONYMS USED IN THIS DOCUMENT

Ag	Gold
AIRFA	American Indian Religious Freedom Act
ARD	Acid Rock Drainage
ARPA	Archaeological Resources Protection Act
Au	Silver
BLM	Bureau of Land Management
CCAMW	Cooke City Area Mineral Withdrawal
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CERCLIS	CERCLA Information System (potential Superfund sites list)
cfs	Cubic Feet per Second
CFR	Code of Federal Regulations
CNF	Custer National Forest
Cu	Copper
CWA	Clean Water Act
DEQ	Department of Environmental Quality
DEIS	Draft Environmental Impact Statement
DNRC	Department of Natural Resources and Conservation
DSL	Department of State Lands
EIS	Environmental Impact Statement
EPT	Ephemeroptera Plecoptera Trichoptera
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FLPMA	Federal Land Policy and Management Act of 1976
FP	Forest Plan
FS	Forest Service
GIS	Geographic Information System
GNFFP	Gallatin National Forest Land and Resource Management Plan
GYA	Greater Yellowstone Area
HD	Hunting District
IDT	Interdisciplinary Team
km	Kilometer
kV	Kilovolt
KOP	Key Observation Point
LRMP	Land and Resource Management Plan
MA	Management Area
MABF	Mean Annual Base Flow
MDEQ	Montana Department of Environmental Quality
MDFWP	Montana Department of Fish, Wildlife and Parks
MIH	May impact individuals, but is not likely to cause a trend to federal listing or loss of viability
MIS	Management Indicator Species
MO	Molybdenum
MPDES	Montana Pollutant Discharge Elimination System
MSL	Mean Sea Level
MU	Multiple Use
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest System (lands)
NHP	National Heritage Program
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System

NPS	National Park Service
NRHP	National Register of Historic Places
NWM	New World Mine
NWMD	New World Mining District
NWP	New World Project
NYWR	Northern Yellowstone Winter Range
OHV	Off Highway Vehicle
Pb	Paladium
PDEIS	Preliminary Draft Environmental Impact Statement
PGE	Copper-gold-platinum group element
PLO	Public Land Order
PSD	Prevention of Significant Deterioration
RA	Roadless Area
RPA	Resource Planning Act
RPA	Resource Protection Act
RVD	Recreation Visitor Day
SHPO	State Historic Preservation Office
SIL	Scenic Integrity Level
T & E	Threatened and Endangered Species (federal)
TDS	Total Dissolved Solids
TMDL's	Total Maximum Daily Loads
UNESCO	United Nations Educational, Scientific, and Cultural Organization
USC	United States Code
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VER	Valid Existing Rights
VQO	Visual Quality Objective

CHAPTER 1

PURPOSE AND NEED FOR ACTION

INTRODUCTION

This Environmental Impact Statement (EIS) discloses the potential environmental consequences of implementing alternatives for managing federal locatable and leasable hardrock mineral resources on National Forest land near Cooke City, Montana. The USDA Forest Service (FS) and the USDI Bureau of Land Management (BLM) are co-lead agencies responsible for preparation of the EIS. The Secretary of the Interior will use the information in this EIS as the basis for a decision on future management of the federal mineral resource. The analysis in this EIS complies with provisions of the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations, Federal Land Policy and Management Act of 1976 (FLPMA), and the National Forest Management Act (NFMA).

BACKGROUND

On August 25, 1995, President Clinton toured the site of the then proposed New World Mine near Cooke City, Montana, and expressed concerns about potential effects of mining on the area's outstanding natural resources. Following that tour, the President declared a two-year moratorium on any new mining claims in the area. The two-year period provides time for lead agencies to complete an environmental study of a longer term mineral "withdrawal."

A mineral withdrawal prevents filing of new mining claims on federal lands under the General Mining Law of 1872. Withdrawals are implemented to limit mineral-related activities in order to maintain other resource values in the area (43 Code of Federal Regulations (CFR) 2310).

The petition to pursue a mineral withdrawal was approved by the Secretary of the Interior on August 28, 1995. With the publication of a *Federal Register* notice on September 1, 1995, the two-year moratorium on new mining claims (known as a segregation) went into effect. Unless a mineral withdrawal is approved by the Secretary of the Interior by August 31, 1997, federal lands within the area will reopen to filing of new mining claims.

In response to the New World Mine (NWM) Agreement of August 12, 1996 (New World Mine Agreement, August, 1996), the withdrawal application was amended on September 16, 1996, and the amendment was published in the

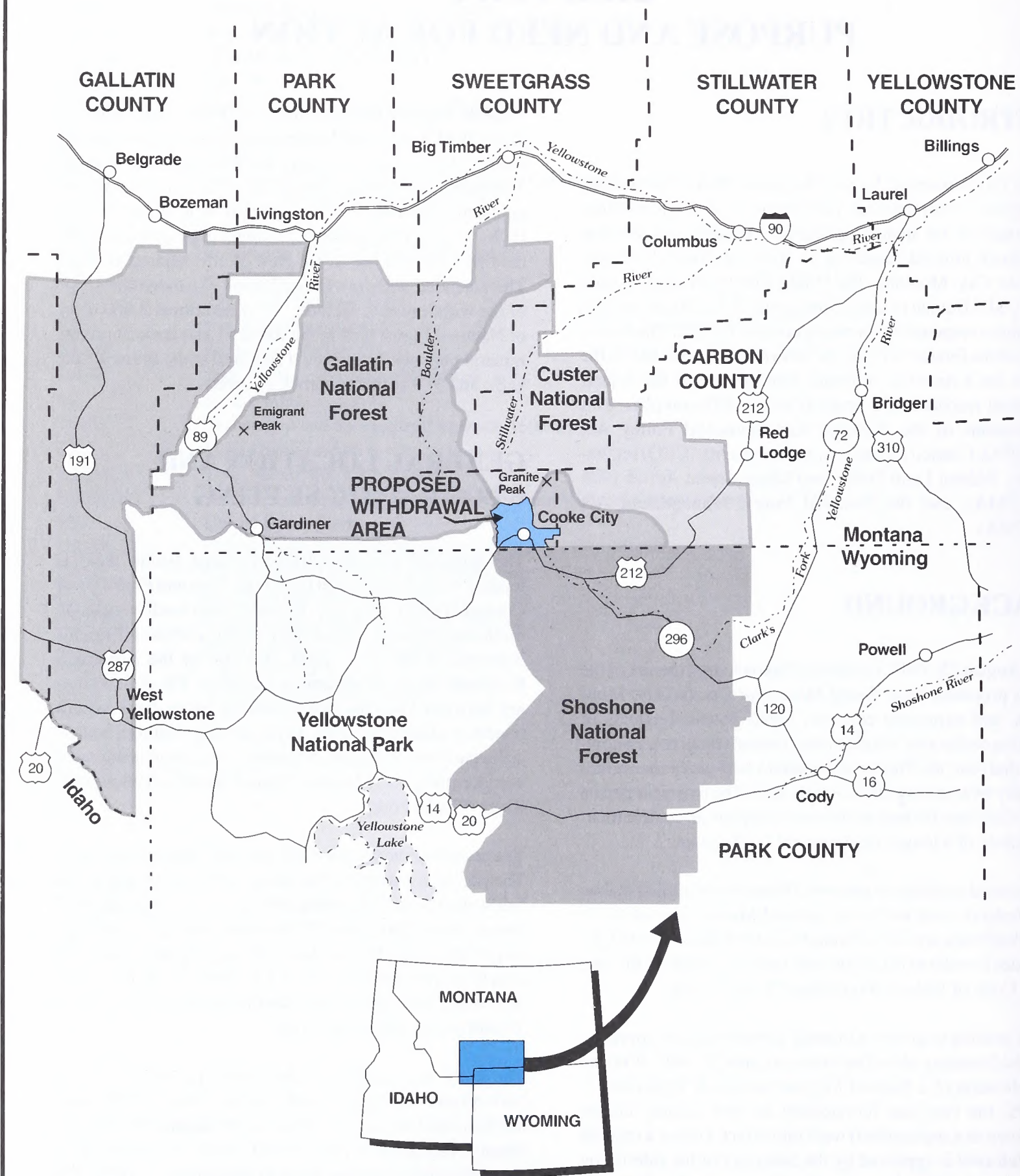
Federal Register on September 20, 1996, (Appendix A). The NWM Agreement between the United States, Crown Butte Mines, Inc. (Crown Butte), and the Greater Yellowstone Coalition, provides for cessation of the permit application process for the proposed New World Project (NWP), and acquisition (by exchange) of property interests held by Crown Butte in the New World Mining District. The amended withdrawal application expanded the scope of the withdrawal to include: 1) an additional 2,960 acres of National Forest land in the Kersey Lake area; 2) private mineral interests in the area if acquired in the future by the U.S.; and 3) leasable hardrock minerals.

GENERAL LOCATION AND GEOGRAPHIC SETTING

The proposed mineral withdrawal area (study area) is located in the Gallatin and the Custer National Forests near Cooke City, MT, Map 1-1. The study area is adjacent to the northeast corner of Yellowstone National Park (NP) and is bordered on the west, north, and east by the Absaroka-Beartooth (A-B) Wilderness in Montana. The state boundary between Montana and Wyoming forms the southern boundary of the study area. Adjacent to the southern boundary is the North Absaroka Wilderness and a non-wilderness corridor along US 212 and the Clarks Fork of the Yellowstone River (Clarks Fork).

The mountains within the study area form three watersheds. The northern portion of the study area drains north to the Stillwater River. The southwestern portion of the study area drains into Yellowstone NP via Soda Butte Creek, a tributary to the Lamar River. The southeast portion of the study area flows into the Clarks Fork. Elevations within the study area range from under 7,400 feet near Silver Gate to over 10,600 feet at Sheep Mountain.

The study area consists of approximately 26,160 acres of both private and federal lands. Of this, about 22,000 acres are National Forest lands. Scattered throughout the area are about 4,160 acres of private land consisting primarily of patented mining claims. Prior to September 1, 1995, 470 unpatented mining claims had been filed in the area. About 590 acres of National Forest lands are currently withdrawn from mineral entry to protect administrative sites and campgrounds in the area. Outside the study area, Yellowstone NP and the surrounding wilderness areas are also withdrawn from mineral location.



MAP 1-1

**General Vicinity of the Proposed
Cooke City Area Mineral Withdrawal**

PROPOSED ACTION

The Department of the Interior proposes to withdraw from locatable hardrock mineral entry National Forest land near Cooke City, MT and Yellowstone NP, Map 1-2. The proposed mineral withdrawal is for up to 22,000 acres of federal lands, subject to **valid existing rights** associated with the 470 existing unpatented mining claims in the withdrawal area. While all federal lands are withdrawn from mineral entry, the mineral withdrawal may or may not affect up to 4,240 acres of unpatented mining claims depending upon valid existing rights. If these unpatented mining claims are abandoned, or are determined to be invalid by the United States, mineral development activities would be limited at that time. The mineral withdrawal would immediately affect 17,760 acres of federal lands where no mining claims currently exist. The withdrawal would be subject to review at the end of 20 years.

Also subject to the proposed withdrawal would be any private minerals that may be acquired in the study area by the United States. For example, if the U.S. acquires private minerals in this area, which may occur under the NWM Agreement, the acquired minerals would not be available for mineral entry under the General Mining Law of 1872, (30 USC 21-54). Any acquired minerals would also be withdrawn from hardrock mineral leasing under the Acquired Lands Mineral Leasing Act of August 7, 1947, (30 USC 351-359).

If the proposed withdrawal is approved, the Custer and Gallatin National Forest Land and Resource Management Plans (Forest Plans) would be amended. Appendix D of the Gallatin Forest Plan and Appendix IV of the Custer Forest Plan would be amended to include the mineral withdrawal. In addition, the Gallatin Forest Plan would be amended to reallocate areas within the study area currently allocated as Management Area 24, (minerals emphasis), to Management Area 15, (grizzly bear/dispersed recreation emphasis).

PURPOSE AND NEED

President Clinton expressed concerns about the effects of mining on the area's outstanding natural resources. The Assistant Secretary of the Interior (Policy, Management, and Budget), with concurrence by the Under Secretary of Agriculture (Natural Resources and Environment), proposed the mineral withdrawal. A withdrawal is an administrative tool, available to the Secretary, to limit mineral-related activities in order to maintain other resource values in the area.

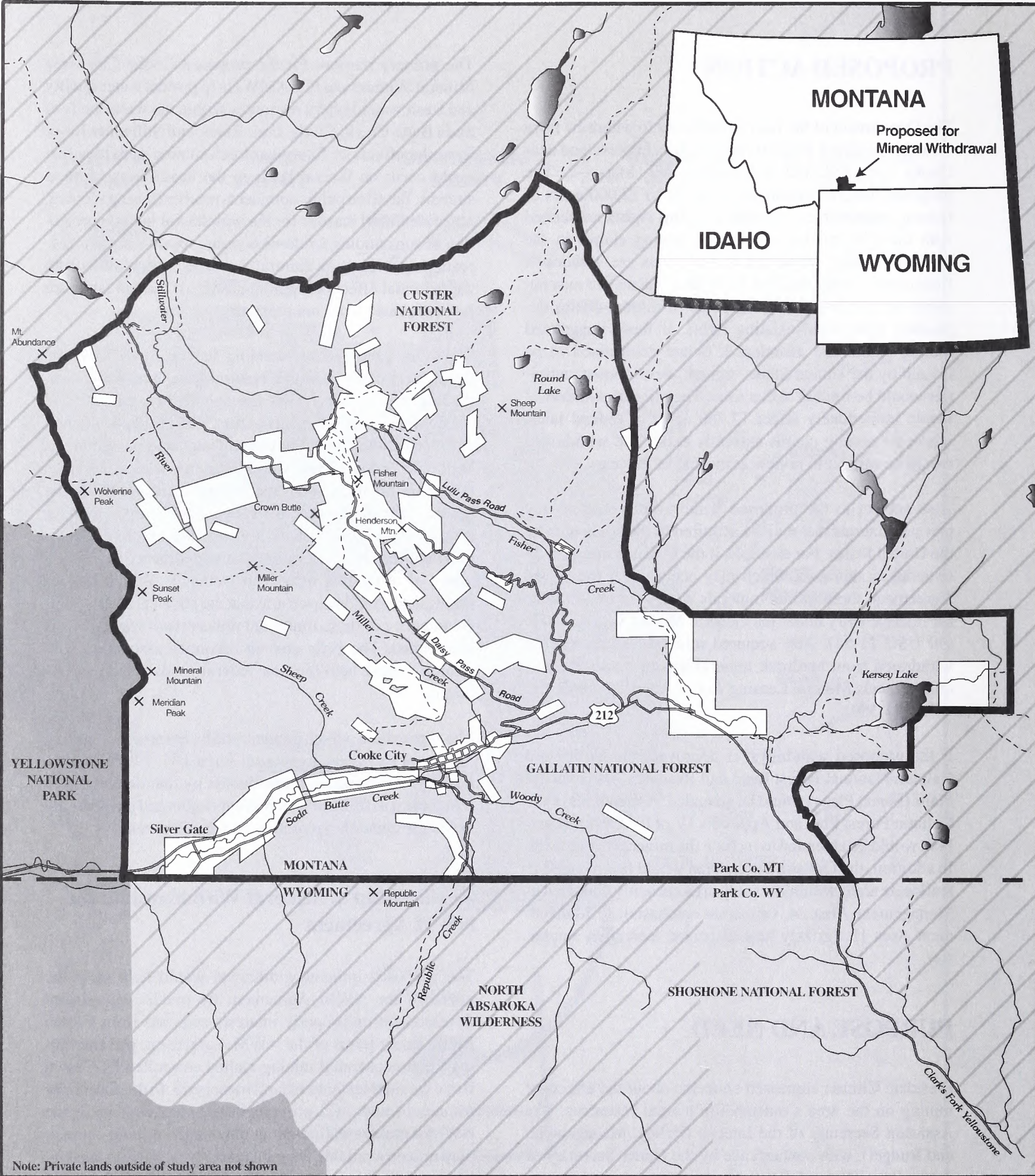
The primary purpose for the proposed Cooke City Area Mineral Withdrawal (CCAMW) is to protect water quality and fresh water fishery resources within the watersheds of Soda Butte Creek, Clarks Fork River, and Stillwater River from the effects of future hardrock mining activities that could occur on federal lands in the headwaters of these streams. Based on public comments received during scoping, other identified reasons for the withdrawal include protection of surrounding wilderness areas, scenic integrity, recreation opportunities, cultural resources, and wildlife from the potential effects of mining activity if federal lands are not withdrawn from mineral entry.

The study area and surrounding federal lands form the headwaters of Outstanding Natural Resource Waters, including streams which flow through Yellowstone NP and Wilderness areas. Segments of the Clarks Fork, Stillwater, and Soda Butte Creek are either designated or eligible as Wild and Scenic rivers. Certain mining-related activities pose risks to these watersheds. These risks include the potential for increased acid-rock drainage, the potential for ground-water contamination from underground mines, potential for failure of tailings impoundments and uncertainty of mitigating effects to wetlands. Withdrawal of these lands would help ensure that the physical and biological integrity of these important downstream watersheds is maintained. The risks and uncertainties associated with mining-related activities on federal lands would be reduced.

The segregation, which prevents the location of new mining claims for two years, expires on August 31, 1997. Unless a mineral withdrawal is implemented by that date, the area will reopen to filing of new mining claims and the potential exists for mineral exploration and development.

Relationship of Mineral Withdrawal to the NWM Agreement

The proposed mineral withdrawal would help meet the intent of the NWM Agreement by precluding mineral development on property interests acquired from Crown Butte. Under terms of the NWM Agreement, private minerals and unpatented mining claims controlled by Crown Butte would transfer to federal ownership. In the absence of a mineral withdrawal, property interests acquired under the NWM Agreement, (including unpatented mining claims), may remain available for mineral entry or mineral leasing. For example, lands donated to or purchased by the United States are not available for mining under the General Mining Law of 1872; however, they are available for mineral leasing. Interests acquired by the United States via land exchange may be available under the mining law. If



Note: Private lands outside of study area not shown

	Yellowstone National Park	Study Area Boundary
	Wilderness	Streams
	Private lands (not subject to withdrawal)	Trails
	National Forest Land	Roads
		National Forest Boundary

MAP 1-2

**NATIONAL FOREST LANDS
PROPOSED FOR MINERAL
WITHDRAWAL**

Crown Butte's unpatented mining claims are relinquished and no mineral withdrawal is in place, new mining claims could be filed on these lands. The proposed mineral withdrawal, in concert with the NWM Agreement, ensures that mining would not occur on any acquired properties. The NWM Agreement was established to protect Yellowstone NP and the surrounding area, other significant natural resources, and the Clarks Fork River.

SCOPE OF THE ANALYSIS

This EIS discloses the potential environmental consequences of two alternative strategies for management of federal mineral resources, No Action (no withdrawal) and the Proposed Action (withdrawal). Several additional alternatives were identified during public scoping and were considered but not studied in detail in the EIS. Chapter II, Alternatives, describes why the additional alternatives were not analyzed in detail.

The mineral withdrawal decision focuses on a policy level decision concerning the appropriateness of future mining on federal lands in the area considering other public values present. The broader look at the area differs from the project level analysis used for the NWP. By nature, the project level analysis focuses on alternatives and mitigation designed to resolve resource issues and mitigate the effects of mining. Project level decisions do not address the larger policy issue of whether mining should occur in this area.

The proposed CCAMW and the NWM Agreement are not considered connected actions in that either action could proceed independent of the decision on the other action (36 CFR 1508.25 (a)(1)). However, the extent of mineral estate withdrawn from mineral entry varies depending upon the status of the NWM Agreement. While the NWM Agreement is a reasonably foreseeable action, there is a clause in the Agreement that allows for cancellation of the Agreement at the end of 6, 12, or 18 months. Therefore, each alternative is evaluated assuming two scenarios - the NWM Agreement is implemented, and the NWM Agreement is **not** implemented. This provides for disclosure of the effects of a mineral withdrawal regardless of the outcome of the NWM Agreement. Refer to Chapter 2, Alternatives, for a detailed description of the alternative scenarios.

Along with potential direct and indirect effects, the effects of past, present and reasonably foreseeable future actions also are described in this document. Effects of past and present activities in the area (such as historical mine-related activities that have affected water quality) are represented in the Affected Environment sections of the resource discussions associated with each issue analyzed. Cumulative

effects resulting from reasonably foreseeable activities are also summarized for each alternative.

In accordance with NEPA, a preferred alternative is identified as part of this EIS.

DECISIONS TO BE MADE

The authority to withdraw lands from mineral entry lies with the Department of the Interior. The Secretary of the Interior will decide what lands, if any, to withdraw, and for how long. The Secretary is limited to a maximum withdrawal period of 20 years (FLPMA 204 (c)(1)). At the end of the 20 year period, the withdrawal decision will be reviewed to determine if it is appropriate to extend or terminate it. If a withdrawal of more than 5,000 acres is approved, the Secretary of the Interior will immediately advise Congress of the withdrawal action being taken.

The Montana State Director, Bureau of Land Management, with concurrence from the Regional Forester, Northern Region, U.S. Forest Service, will submit a recommendation to the Director of the Bureau of Land Management. The recommendation and supporting documentation will then be forwarded to the Secretary of the Interior for a decision. If the Secretary chooses to implement a withdrawal, a Public Land Order will be filed in the *Federal Register*. The withdrawal would become effective on the date the Federal Register Notice is published in the *Federal Register*.

The affected lands are administered by the Gallatin and Custer National Forests. If the withdrawal is approved, the Forest Supervisors of the Custer and Gallatin National Forests would amend Forest Plans to reflect the change in management of locatable and leasable hardrock minerals. The decision on Forest Plan amendments would be concurrent with or following the Secretary of the Interior's withdrawal decision.

Decisions Beyond the Scope of this Analysis

The original boundary for the proposed withdrawal that was published in the *Federal Register* on September 1, 1995 included National Park lands as well as lands within the A-B Wilderness. These lands are currently withdrawn from mineral entry by statute. Therefore, these areas are excluded from the proposed CCAMW decision.

The proposed mineral withdrawal does not apply to private lands, valid existing rights associated with existing unpatented mining claims; fluid leasable minerals (e.g., oil, gas, geothermal); saleable minerals (sand and gravel); rights-of-

way; ingress or egress to existing patented and unpatented mining claims adjacent to or in the vicinity of, the lands to be withdrawn; or any other authorized surface uses on lands under the administration of the Custer and Gallatin National Forests. Decisions regarding future mining on private land or unpatented mining claims are beyond the scope of this analysis. Such decisions are subject to appropriate state and federal regulations and a separate environmental review process.

A withdrawal decision would not affect a claimant's right to hold and maintain valid, existing unpatented mining claims within the withdrawal area. Unpatented claims require annual payment of a claim maintenance fee to retain rights associated with the mining claim. If annual filings are performed and there is a discovery of valuable minerals as described under the mining laws, the withdrawal would not affect these rights. However, if either of these conditions are not maintained, rights associated with the unpatented claims would revert to the federal government and the land and minerals would be subject to the terms and conditions of the proposed mineral withdrawal.

The NWM Agreement provides for acquisition by the U.S. of private minerals and unpatented mining claims held by Crown Butte. The decision to exchange property interests and any subsequent environmental analysis that may be necessary to implement this agreement is beyond the scope of this analysis. However, if any private mineral estate or unpatented mining claims within the boundaries of the proposed withdrawal are acquired by the U.S. as a result of this Agreement, those interests would be subject to the withdrawal.

If the NWM Agreement is not implemented, the permitting process for the NWP could resume. The decision to withdraw about 22,000 acres of National Forest land from mineral entry is a separate and distinct decision from approval of a plan of operations or associated permits for the NWP. While they are not considered connected actions, (since either action could be implemented independent of the decision regarding the other), the proposed mineral withdrawal would eliminate three of the eight alternatives studied in the NWP Preliminary Draft EIS (PDEIS). Refer to the Land Use section in Chapter 3 of this EIS for additional discussion of this subject.

ISSUES AND CONCERNS

Public Involvement

Issues were identified through scoping meetings and from 190 letters received from individuals, organizations and

agencies. From the results of scoping, the lead agencies identified nine issues topics to be addressed in the environmental analysis. Chapter 4, Consultation and Coordination, discusses public involvement activities in greater detail.

Issues

Issues are categorized according to primary resources or topics. For each primary resource or topic, several sub-issues are addressed. For example, recreation use, wilderness, roadless areas, Wild and Scenic rivers, scenic integrity, and Yellowstone NP are discussed individually as sub-issues under the heading, "Recreation, Yellowstone National Park, and Special Areas".

Each issue is summarized briefly in the following section. In accordance with NEPA regulations, the lead agencies used these issues as the focus of the EIS.

Water Quality and Quantity - What is the potential for the proposed mineral withdrawal to maintain surface and ground-water quantity and quality?

The headwaters of three drainages - the Clarks Fork, Stillwater River, and Soda Butte Creek - are within the study area. Soda Butte Creek is a tributary to the Lamar River, a major river within Yellowstone NP. Approximately 38 percent of the study area drains into Yellowstone NP. The Clarks Fork is a designated Wild River about 20 miles downstream from the study area. Approximately 36 percent of the study area is within the Clarks Fork drainage. Approximately 26 percent of the study area drains into the Stillwater River. The Clarks Fork and the Stillwater Rivers flow into designated wilderness. All three rivers where they flow through wilderness or Yellowstone NP are designated Outstanding Natural Resource Waters with a water quality standard of non-degradation.

A major concern is the effect of future mining on water quality. Underground or surface mining operations, including ore extraction and storage of tailings within portions of the study area would expose sulfide bearing minerals to water which would increase the potential for acid-rock drainage. Historical mining activities such as ore extraction and disposal of tailings has resulted in increased acid drainage, particularly in Fisher Creek and Daisy Creek. Ground water may be affected if subsurface flows are altered due to surface disturbance or underground mining. Streamflows could also be altered by mining, which could affect downstream water rights.

A mineral withdrawal could reduce the risk of mining-related effects to groundwater or surface water quality and altered streamflows.

Wetlands - What is the potential for the proposed mineral withdrawal to protect and maintain the amount, function, and values of wetlands and waters of the U.S. that could otherwise be affected by mining?

Wetlands, lakes, and streams are common in the study area. Future mining facilities such as access roads, tailings impoundments, and waste rock areas may result in a loss of wetlands or affect their function and value. A mine itself, whether underground or surface, could also effect wetlands. The proposed mineral withdrawal would prevent mineral activities on wetlands subject to the withdrawal.

Aquatics - What is the potential for the proposed mineral withdrawal to protect, maintain or improve habitat for fish and other aquatic life that could otherwise be affected by mining?

Mining-related activities may affect habitat for fish and other aquatic life. Potential effects include additional acid drainage, increases in sediment, altered stream flow, temperature changes, or direct loss of aquatic habitat. The proposed mineral withdrawal could reduce the risk of mining related effects on aquatic habitat.

Recreation, Yellowstone NP, and Special Areas - What is the potential for the proposed mineral withdrawal to protect scenic, aesthetic, and recreation values within the study area and in the adjacent Yellowstone NP, A-B Wilderness, the North Absaroka Wilderness, and designated and eligible wild and scenic rivers from the effects of mining?

Many commenters referred to the beauty of the area surrounding Yellowstone NP and the A-B Wilderness. The study area is part of the Beartooth Plateau, a popular area for sightseeing, hiking, backpacking, fishing, hunting, wildlife watching, cross country skiing, and snowmobiling. Several major trails enter the A-B Wilderness from the study area.

The potential effects of future mining on recreation opportunities and scenic integrity is a concern. The mineral withdrawal may help maintain the existing character, settings, recreation experiences, and opportunities. Yellowstone NP borders the study area for three miles. US Highway 212 through Cooke City and Silver Gate is the northeast entrance to the Park. A mineral withdrawal could reduce the potential for mining-related effects to the Park's water quality, air quality, wildlife, and recreation experiences. Future mineral development could affect Park operations due to increased local populations and increased winter access.

The A-B Wilderness borders approximately 12 miles of the proposed withdrawal area on the east, west, and north boundaries. Approximately six miles of the North Absaroka Wilderness in Wyoming borders the southern boundary of the study area. Four roadless areas encompass approximately 60 percent of the study area. Roadless areas include the Beartooth, Republic Mountain, Reef, and the North Absaroka. Future mining could diminish existing opportunities for solitude in nearby wilderness by introducing noise and artificial lighting. Mining claims could be filed in roadless areas increasing the potential for future mineral development that could alter the character of the roadless areas.

All streams within the study area form the headwaters of existing or eligible wild and scenic rivers. The Clarks Fork is a designated wild river 20 miles downstream from the study area. The Stillwater River within and downstream from the study area is an eligible river as is Soda Butte Creek in Yellowstone NP.

Land Uses - What is the potential for the proposed mineral withdrawal to affect uses of private land, unpatented mining claims, and future mining including the New World Project? How does the mineral withdrawal affect the availability of minerals in the study area?

The study area has high occurrence potential for gold, copper, silver, lead and zinc including proven mineral reserves and sufficient indications that additional mineral resources may be discovered. The area's mining history dates back to the late 1860's. The need for a mineral withdrawal was questioned, particularly when considering existing environmental laws designed to protect resources, and technology available to mitigate mining-related effects. The withdrawal could affect mineral development on private land and on unpatented mining claims on National Forest land by limiting availability of adjacent federal lands for mining-related facilities such as millsites and tailings impoundment. The mineral withdrawal affects several alternatives under consideration for the proposed NWP (in the event the NWM Agreement is not implemented).

Economics - What are the economic implications of the proposed withdrawal?

The study area's economy is strongly influenced by four factors: proximity to Yellowstone NP, limited access and severe winter weather, increasing reliance on recreation and tourism in local and regional economy, and a large share of non-earned income (rather than wages) as a source of resident income. The local and regional economies have been growing in recent years; employment, wages, population, and housing demand have increased. Growth is ex-

pected to continue with or without mining. Mining-related jobs are generally higher paying jobs than service sector jobs. A mineral withdrawal could preclude income and employment opportunities that may be provided through mining.

Social - What is the potential for the proposed withdrawal to preclude changes in population, in the need for additional housing and services, and to the overall quality of life that may result from mining?

Changes to the social structure and diversity in the study area could occur due to mining-related development. Concerns about future mining include increase in population, loss of recreation opportunities, increased traffic, shortage of housing, and changes to the overall quality of life. Other local residents support mining for the economic stimulus and improvements to local infrastructure and services that could occur. Concerns from Park County, Wyoming (Cody), include the potential need for increased services due to an influx of mine workers. Those residents of Cooke City/Silver Gate, MT that were surveyed, rated a clean environment, recreation and tourism, low crime rate, and a low growth economy as the four most important economic and social factors. Many people choose to live in this area because of the quality of the natural environment, recreation opportunities, serenity and privacy.

Cultural - What is the potential for the proposed mineral withdrawal to protect the area's cultural resources that could otherwise be affected by mining?

The study area has been used for mining since the late 1860's. Because it contains many historic mining structures, the area has been listed as the New World Historic District by the National Register of Historic Places. There are 97 cultural resource sites recorded in the study area consisting of 83 historic and 14 prehistoric sites. The proposed mineral withdrawal may help protect cultural resources from future mining-related disturbances.

Wildlife - What is the potential for the proposed mineral withdrawal to protect or maintain wildlife habitat, particularly grizzly bear habitat and populations that could otherwise be affected by mining?

The study area provides spring, summer, and fall habitat for the grizzly bear, a threatened species under the Endangered Species Act. Other threatened or endangered species that may be present include bald eagle, gray wolf, and peregrine falcon. The area also provides summer and fall habitat for elk and mule deer and year-round habitat for moose. A mineral withdrawal may reduce future disturbance and habitat alteration related to mining.

CHAPTER 2

ALTERNATIVES

INTRODUCTION

This chapter is the “heart” of the EIS (40 CFR 1502.14). It describes two alternatives analyzed in detail as well two scenarios for each alternative that form the basis of the environmental analysis. Alternative A, the “No Action” Alternative, would not withdraw federal land within the study area from mineral location. Alternative B is the proposed mineral withdrawal of approximately 22,000 acres of federal land.

The alternatives were formulated in response to an application to pursue a mineral withdrawal that was approved by the Secretary of the Interior on August 28, 1995. Following the New World Mine (NWM) Agreement of August 12, 1996, the withdrawal application was amended on September 16, 1996. The amended withdrawal application expanded the scope of the withdrawal to include: 1) an additional 2,960 acres of federal land in the Kersey Lake area; 2) private mineral interests in the area if acquired in the future by the U.S.; and 3) leasable hardrock minerals. The Kersey Lake area was also included in the expanded scope of the withdrawal based on public concerns expressed during the initial stages of scoping.

Formulation of the alternatives was also influenced by input from the public as well as from agencies during the scoping period required by the National Environmental Policy Act of 1969 (NEPA).

The mineral withdrawal decision is a separate and distinct decision from any decisions concerning the NWM Agreement or the previously proposed NWP plan of operations. However, any acquired private land or relinquished unpatented mining claims would be subject to the withdrawal; therefore, the extent of the mineral estate subject to the withdrawal depends on the status of the NWM Agreement. A cancellation clause within the NWM Agreement allows the NWM Agreement to be terminated 6 months, 12 months, or 18 months after the NWM Agreement was signed if certain conditions are not met. Since the outcome of the NWM Agreement may not be known until after completion of this EIS, each alternative is analyzed assuming two scenarios.

The first scenario for each alternative assumes the NWM Agreement **is not** implemented; while the second scenario assumes that the NWM Agreement **is** implemented. Each

scenario includes a different set of assumptions consisting of a description of the land available for mining, a mineral development forecast (Appendix B), and identification of other reasonably foreseeable activities in and around the study area. Maps of each scenario are used to indicate what land would be withdrawn from mineral location and entry as well as to indicate most likely areas of mineral development. These scenarios form the basis for the environmental impact analysis.

Table 2-1 summarizes the status of the mineral estate for each scenario. This is included to assist the reader in understanding how much land would remain available for potential future mining with each alternative and scenario.

Also described in this chapter are management actions and requirements that are common to both alternatives. This is followed by a summary of the environmental consequences presented in a comparative format to illustrate differences in effects between the alternatives. Identification of the agencies’ preferred alternative is based on analysis of impacts summarized in this document.

The last section describes other alternatives that were considered but eliminated from detailed study. This section includes a brief description of those alternatives and explains why they were not analyzed in detail.

ALTERNATIVES STUDIED IN DETAIL

Alternative A: No Mineral Withdrawal (No Action)

This alternative is referred to as the “No Action” Alternative because no action would be taken by the Secretary of the Interior to withdraw the area from mineral location and entry. It would continue the federal minerals management that existed prior to September 1, 1995, when the study area was closed to location of new mining claims for a two-year study period. Under this alternative, federal lands (approximately 22,000 acres) would remain available for mineral exploration and development under the General Mining Law of 1872. Mining claims could be staked for minerals considered to be “locatable” (e.g., gold, copper, silver, lead,

TABLE 2-1 STATUS OF MINERAL ESTATE (acres approximate)

LAND STATUS	ALTERNATIVE A: NO MINERAL WITHDRAWAL		ALTERNATIVE B: PROPOSED MINERAL WITHDRAWAL	
	Scenario A-1: NWM Agreement Not Implemented	Scenario A-2: NWM Agreement Implemented	Scenario B-1: NWM Agreement Not Implemented	Scenario B-2: NWM Agreement Implemented
Federal Lands Subject to the Proposed Mineral Withdrawal	0	0	22,000	22,000
Federal Lands Available for Mining				
Unclaimed	17,760	17,760	0	0
Existing Unpatented Mining Claims Subject to Valid Existing Rights	4,240	4,240	4,240	4,240
Less Unpatented Mining Claims Subject to NWM Agreement	0	(4,180*)	0	(4,180)
Total Federal Lands Available for Mining	22,000	17,820	4,240	60
Private Lands Available for Mining				
Total Private Lands	4,160	4,160	4,160	4,160
Less Private Lands Subject to NWM Agreement	0	(1,740*)	0	(1,740)
Remaining Private Lands Available for Mining	4,160	2,420	4,160	2,420
Total Federal and Private Lands Available for Mining	26,160	20,240	8,400	2,480

*This figure is derived by assuming the mineral estate on these acres would be withdrawn by a separate withdrawal action.

zinc, and platinum). These claims would give the locators exclusive possessory rights to the federal mineral deposits subject to conditions under the General Mining Law of 1872 and other applicable statutes.

Exploration and mining for locatable minerals on National Forest System Lands would be subject to the surface management regulations found in 36 CFR 228 Subpart A and other applicable state and federal laws. Surface occupancy and use under the mining laws would be limited to uses reasonably incident to the mining operations. Bonding would be required in accordance with FS and State of Montana policies. All significant disturbances would require filing a plan of operations with the FS and the Montana Department of Environmental Quality (MDEQ) and receiving approval before any surface disturbance work could begin.

The Custer and Gallatin Forest Plans would not be amended regarding mineral location, entry, or recreational mining.

This alternative provides a basis for comparing effects with other alternatives. However, the analysis of Alternative A depends on whether or not the NWM Agreement is implemented.

Scenario A-1 provides a basis for analysis if the NWM Agreement is not implemented. Under this scenario, 22,000 acres of federal land would remain available for mineral entry. The hypothetical mineral development forecast (Appendix B) addresses the probability of each of 3 mines, and 10 exploratory drilling operations. The forecast assumes the NWM likely would be developed; however, it assumes a lower probability of two additional mines being developed. Mine reclamation, a work camp for each mine, construction of a powerline between Cody, WY and Cooke City, MT, and plowing US Highway 212 east of Cooke City in the winter are also analyzed as mining related activities. Appendix C provides a more complete description of assumptions used as a basis for impact analysis.

Table 2-2 is a summary comparison of alternatives that also displays the different scenarios analyzed. For Scenario A-1 map 2-1 highlights the 22,000 acres of federal land that would remain available for mineral location and entry subject to the specific management guidelines and applicable law when the existing segregation expires on August 31, 1997. This map also shows the 4,160 acres of private land that would be available for mining and related activities. Under this scenario a total of 26,160 acres (22,000

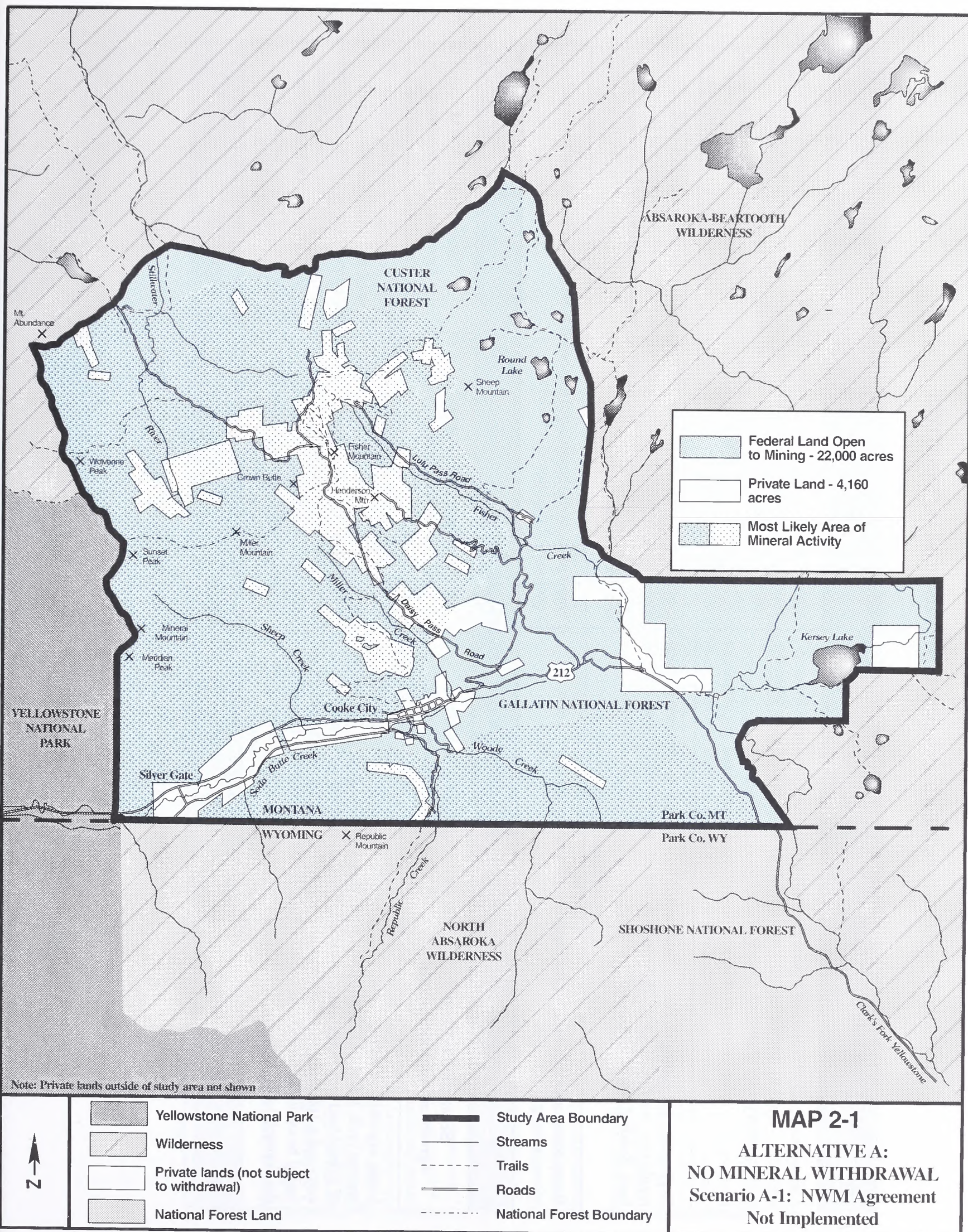


TABLE 2-2 SUMMARY COMPARISON OF ALTERNATIVES

ALTERNATIVE A: NO MINERAL WITHDRAWAL (NO ACTION)	ALTERNATIVE B: PROPOSED MINERAL WITHDRAWAL (PREFERRED ALTERNATIVE)
Approximately 22,000 acres of federal minerals remain open to mineral location and entry subject to specific management guidelines and applicable law when the existing segregation expires on August 31, 1997.	Approximately 22,000 acres of federal minerals, subject to valid existing rights, would be withdrawn from hardrock mineral location and entry for a period of 20 years. The proposed mineral withdrawal would not apply to private lands. However, lands acquired by the federal government would be subject to the terms and conditions of the withdrawal.
Exploration and mining on federal lands would be subject to surface management regulations found in 36 CFR 228 Subpart A and other applicable state and federal laws. Bonding would be required.	Exploration and mining for locatable minerals and leasable hardrock minerals would be prohibited on federal lands without valid existing rights. On federal lands with valid existing rights, exploration and mining would be managed as described for Alternative A.
Forest plans would not be amended regarding mineral location, entry, or recreational mining.	Forest plans would be amended as needed to be consistent with the terms and conditions of the mineral withdrawal.
BASIS FOR ENVIRONMENTAL IMPACT ANALYSIS	
Scenario A-1 NWM Agreement Not Implemented	Scenario A-2: NWM Agreement Implemented
Lands available for mining would amount to 26,160 acres (22,000 acres of federal land remain open to mineral entry and 4,160 acres of private land would be available for mineral development). See Map 2-1.	Lands available for mining would amount to 20,240 acres (17,820 acres of federal land and 2,420 acres of private land). Interests acquired under the NWM Agreement (4,180 acres of unpatented mining claims and 1,740 acres of private land) would not be available for mining. See Map 2-2.
Scenario B-1: NWM Agreement Not Implemented	Scenario B-2: NWM Agreement Implemented
Lands available for mining would amount to 8,400 acres (4,240 acres of federal unpatented mining claims and 4,160 acres of private land). 17,760 acres of federal minerals would be immediately withdrawn from mineral entry. Assumes 4,240 acres of federal land with valid existing rights. See Map 2-3.	Lands available for mining would amount to 2,480 acres (60 acres of unpatented federal mining claims and 2,420 acres of private land). Interests acquired under the NWM Agreement (4,180 acres of federal unpatented mining claims and 1,740 acres of private land) would also be withdrawn. See Map 2-4.

TABLE 2-2 SUMMARY COMPARISON OF ALTERNATIVES (continued)

BASIS FOR ENVIRONMENTAL IMPACT ANALYSIS				
<p>Mineral development forecast includes:</p> <ul style="list-style-type: none"> - 3 Mines (the NWM, another underground mine of similar size [2 % probability], and a surface mine of similar size [10 % probability]) - 10 exploratory drilling operations - mine reclamation - a work camp for each mine - construction of a 69 kV powerline between Cody and Cooke City with 24.9 kV segments to each millsite - plowing Highway 212 east of Cooke City during the winter, and - employee residency in surrounding communities <p>See Map 2-1 for most likely area of development. Most activity would occur on private land.</p>	<p>Mineral development forecast includes:</p> <ul style="list-style-type: none"> - 1 Mine (an underground mine [2 % probability]) - 5 exploratory drilling operations, - mine reclamation - a work camp for the mine - construction of a 69 kV powerline between Cody and Cooke City with 24.9 kV segments to the millsite - plowing Highway 212 east of Cooke City during the winter - employee residency in surrounding communities. <p>See Map 2-2 for most likely area of development. Most activity would occur on federal land.</p>	<p>Mineral development forecast includes:</p> <ul style="list-style-type: none"> - 3 mines (the NWM, another underground mine of similar size [2 % probability], and a surface mine of similar size [10 % probability]) - 7 exploratory drilling operations, - mine reclamation - a work camp for each mine - construction of a 69 kV powerline between Cody and Cooke City with 24.9 kV segments to each millsite - plowing Highway 212 east of Cooke City during the winter - employee residency in surrounding communities <p>See Map 2-3 for most likely area of development. Most activity would occur on private land.</p>	<p>Mineral development forecast includes:</p> <ul style="list-style-type: none"> - No mines - 1 exploratory drilling operation <p>See Map 2-4 for most likely area of development. Activity would occur on private land.</p>	<p>Other reasonably foreseeable independent activities include: Highway construction (maintenance and upgrades between Mammoth and Cooke City); recreation use in Yellowstone NP and surrounding areas would continue to increase; full appropriation of water rights of Soda Butte Creek drainage will limit development in Cooke City and Silver Gate area; residential development in the study area will continue.</p>

federal and 4,160 private) would remain available for potential future mining.

Scenario A-2, NWM Agreement Implemented, is based on the assumption that the total amount of land available for mining and related activities would be reduced from 26,160 acres to 20,240 acres (17,820 acres of federal land and 2,420 acres of private land). The amount of land available for potential future mineral development would be reduced because it is assumed that an estimated 4,180 acres of federal land with valid existing rights and 1,740 acres of private land controlled by Crown Butte would be withdrawn under a separate withdrawal action when acquired by the federal government as part of the NWM Agreement.

The likelihood of mineral development would be much less than with Scenario A-1 (Table 2-2). The hypothetical mineral development forecast for Scenario A-2 addresses the probability of one mine, and five exploratory drilling operations. Mine reclamation, a work camp for the mine, construction of a powerline between Cody, WY and Cooke City, MT, and plowing US highway 212 east of Cooke City in the winter are analyzed as mining related activities. Appendix C provides a more complete description of assumptions used as a basis for impact analysis for this scenario.

Map 2-2 highlights the estimated 17,820 acres of federal land that would remain available for mineral location and entry as well as the most likely areas of potential future mineral activities.

Alternative B: Proposed Mineral Withdrawal

Alternative B is the proposed mineral withdrawal. It would not allow individuals to locate new claims for federal hardrock minerals, including any minerals acquired by the federal government in the future. Federal hardrock minerals managed as leasable minerals (those acquired by donation or purchase) would also be withdrawn from future mineral development. With Alternative B, federal minerals on up to 22,000 acres would be withdrawn from location and entry for a period of 20 years. The withdrawal would be subject to review at the end of this time.

Exploration and mining for locatable minerals (including low impact recreational mining activities) and leasable hardrock minerals would be prohibited on federal lands without valid existing rights. On federal lands with valid existing rights, exploration and mining would be managed as described for Alternative A. The proposed mineral withdrawal would not apply to private lands.

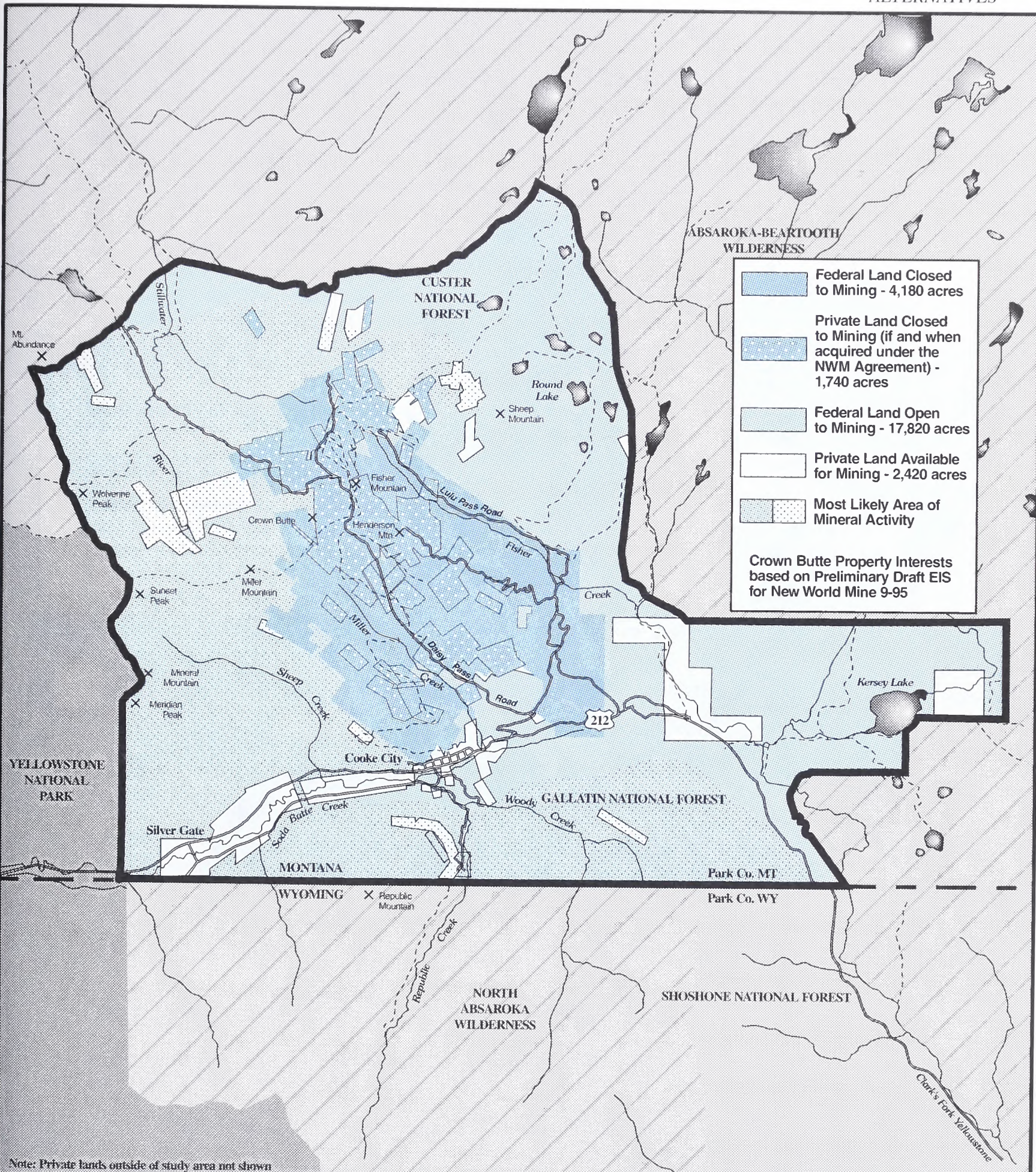
The Gallatin and Custer National Forest Land and Resource Management Plans would be amended to be consistent with the terms and conditions of a mineral withdrawal. The Gallatin National Forest Land and Resource Management Plan (GNFFP, 9/87) would be amended to change Management Area 24 (GNFFP, pg III-67), mineral management emphasis, to the surrounding Management Area 15 (GNFFP, pg III-47), which emphasizes dispersed recreation and management for recovery of the grizzly bear. The Custer National Forest Plan Appendix IV and the Gallatin National Forest Plan Appendix D would be amended to include the mineral withdrawal.

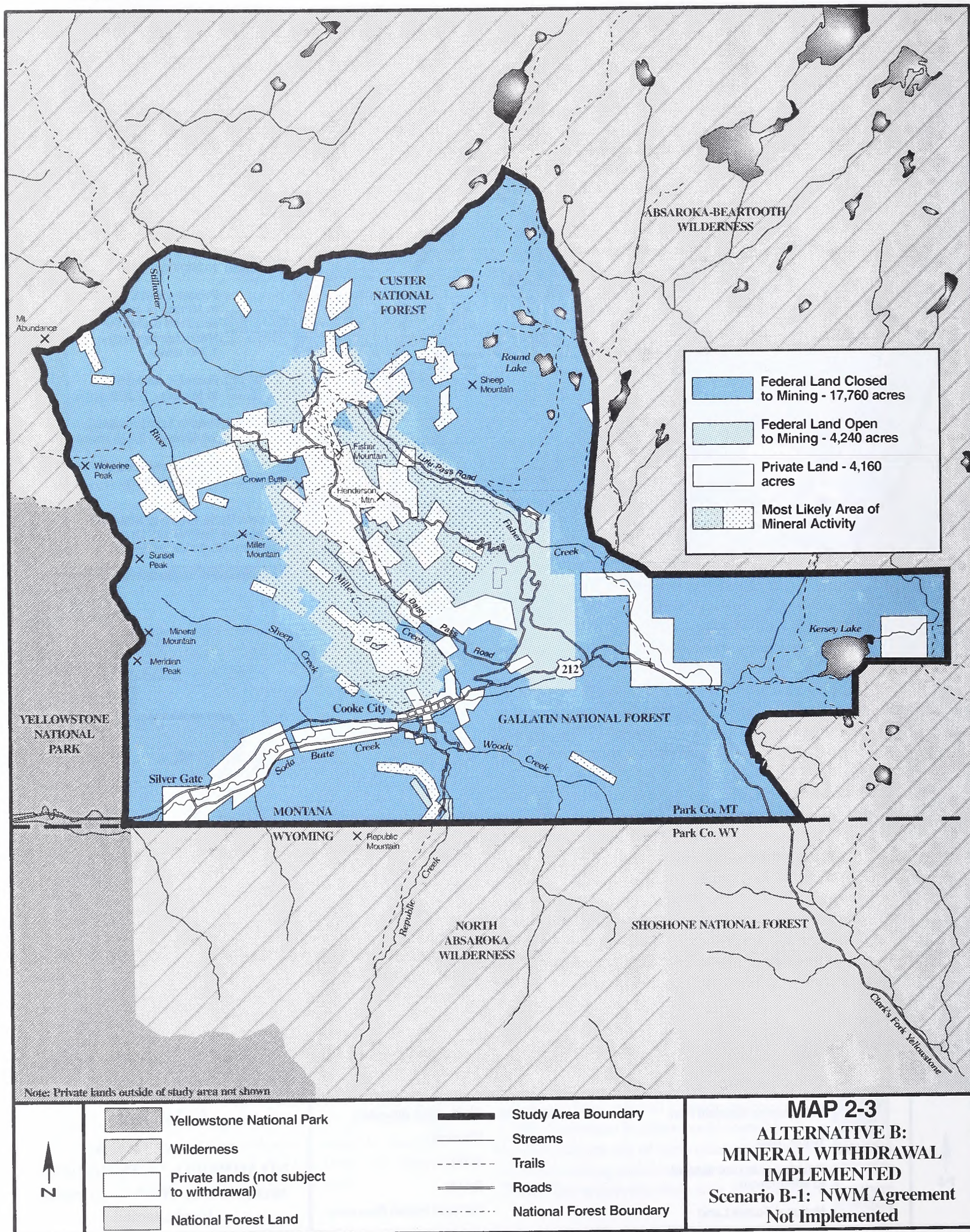
The analysis of Alternative B also depends on whether the NWM Agreement is implemented.

Scenario B-1 provides a basis for analyzing Alternative B if the NWM Agreement is not implemented (Table 2-2). Under this scenario, it is assumed that a total of 8,400 acres (4,240 acres of federal land with valid existing rights and 4,160 acres of private land) would remain available for mining and related activities. An estimated 17,760 acres of federal land would be immediately withdrawn from mineral entry. The hypothetical mineral development forecast addresses the probability of each of three mines and seven exploratory drilling operations. The forecast assumes the NWM would be developed; however, it assumes a lower probability for development of two additional mines. Mine reclamation, a work camp for each mine, construction of a powerline between Cody, WY and Cooke City, MT, and plowing US Highway 212 east of Cooke City in the winter are also analyzed as mining related activities. Appendix C provides a more complete description of assumptions used as a basis for impact analysis.

Map 2-3 highlights the estimated 17,760 acres of federal land that would be withdrawn from mineral location and entry. This map also shows the 4,240 acres of federal land that are assumed to have valid existing rights, and therefore, would remain available for mining and related activities. Under this scenario a total of 8,400 acres (4,240 acres of federal land with valid existing rights and 4,160 acres of private land) would remain available for mining. It is assumed that most of the mineral development related activities would occur on private lands or on federal lands with valid existing rights.

Scenario B-2. If the NWM Agreement is implemented under Alternative B, the unpatented federal mining claims and private land acquired from Crown Butte would be withdrawn from mineral location and entry. Scenario B-2, NWM Agreement Implemented is based on the assumption that the total amount of land remaining available for potential future mining and related activities would be reduced to about 2,480 within the study area. It is estimated that there





are about 60 acres of federal land with unpatented mining claims that are not controlled by Crown Butte within the study area. The likelihood of mineral development with this scenario would be much less than with any of the other scenarios. The hypothetical mineral development forecast for Scenario B-2 would include no mines and only one potential future exploratory drilling operation.

Map 2-4 highlights the estimated 21,940 acres of federal land that would be withdrawn from mineral location. It also shows the estimated 1,740 acres of private lands that would be closed to mining if and when they were acquired by the federal government under the NWM Agreement.

Management Common to All Alternatives

Mining-related activities on federal lands would be subject to surface management regulations described in 36 CFR Subpart 228 and other state and federal laws. Unpatented claims (claims where title to the land is held by the federal government, but right of exclusive possession is held by the locator of the mineral deposit) would also require annual improvements or filing of holding fees. Surface activities on federal lands would be limited to uses reasonably incident to mining operations, i.e. activities such as commercial recreation activities would not be permitted as part of mining operations. Bonding would be required in accordance with Forest Service (FS) and State of Montana regulations. Any significant disturbance would require filing a plan of operations with the FS and the Montana Department of Environmental Quality, and receiving approval before any surface disturbance could begin.

Comparison of Alternatives

Table 2-3 provides a summary comparison of effects for the issues identified in Chapter 1.

Preferred Alternative

Alternative B, Proposed Mineral Withdrawal, is the preferred alternative.

ALTERNATIVES ELIMINATED FROM DETAILED STUDY

The following alternatives were considered but not analyzed in detail for the reasons given below:

Reduce the Size of the Mineral Withdrawal to a Quarter Mile Buffer Adjacent to Yellowstone National Park

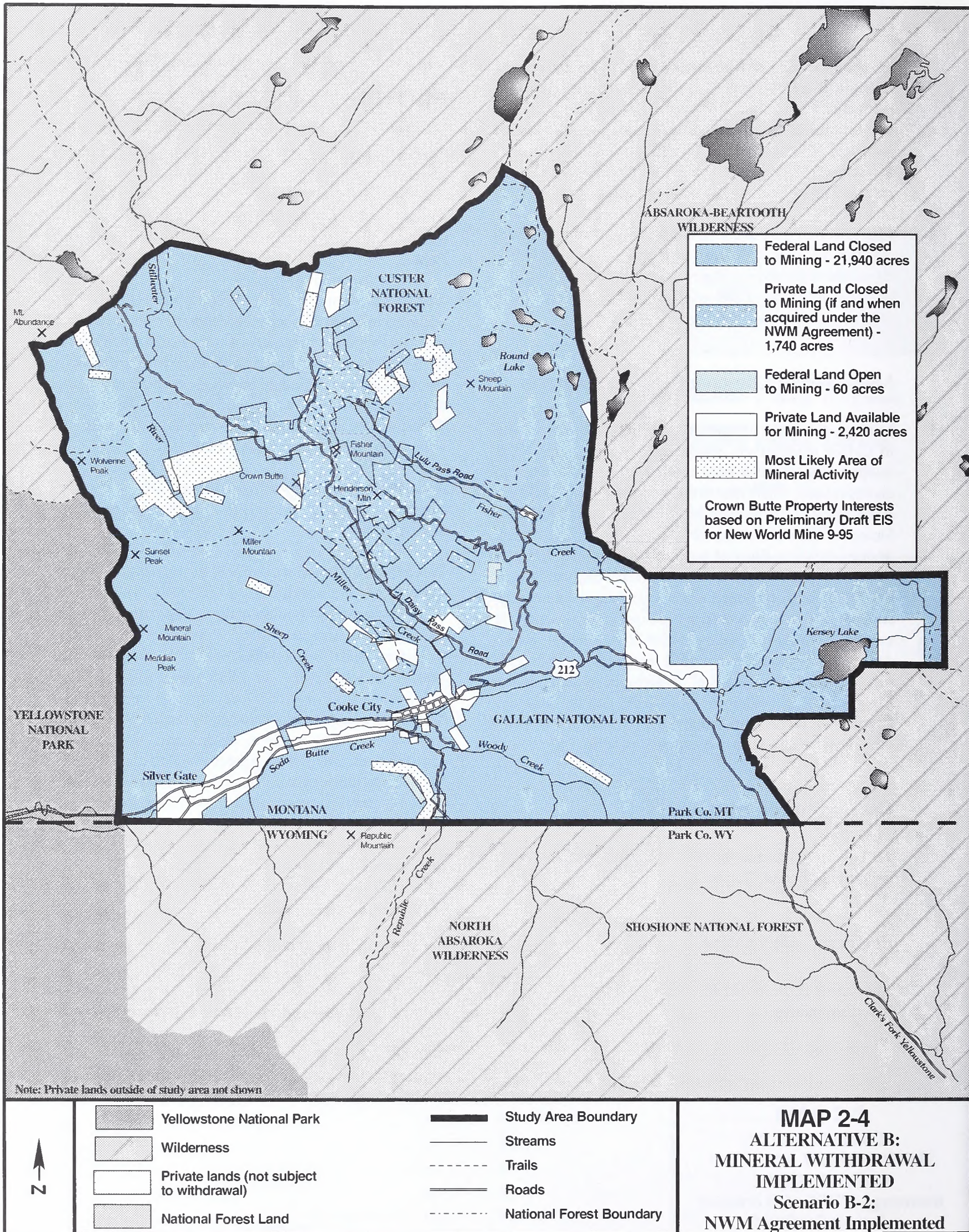
This alternative was raised at a scoping meeting but was not analyzed in detail as a separate alternative because it does not meet the purposes stated in the August 28, 1995 Petition for Withdrawal of Federal Lands. The environmental analysis of this alternative would be based on a level of potential development similar to that anticipated for Alternative A. Therefore, the anticipated effects would be essentially the same as those identified for Alternative A.

Expedite Validity Reviews of Existing Claims (Approximately 4,000 Acres) to Help Meet Purpose and Need.

This additional action was offered by the public to expand the scope of the withdrawal to determine the validity of existing unpatented mining claims. Validation of mining claims is a separate and distinct process from a mineral withdrawal and is beyond the scope of this analysis. NEPA analysis is not required for validation of mining claims. This action would provide information concerning validity of existing claims, but it would not, by itself, better meet the purpose and need or result in different environmental consequences. The NWM Agreement also makes this action largely unnecessary since it is estimated that all but approximately 60 acres of unpatented claims are controlled by Crown Butte.

Reduce the Size of the Mineral Withdrawal to Exclude the Area with the Highest Mineral Development Potential (Withdraw Approximately 17,000 Acres).

Essentially, the effects of this alternative are analyzed under Alternative B, No NWM Agreement. Without the NWM Agreement, these minerals remain open to mineral entry due to existing unpatented mining claims and available private property. The status of the mineral estate with the highest mineral development potential depends primarily upon the outcome of the NWM Agreement rather than on this mineral withdrawal.



Extend the Time Period of the Proposed Withdrawal Beyond 20 Years.

This alternative was not analyzed in detail because the length of the withdrawal period is limited by the Federal Land Policy and Management Act of 1976. (Sec. 204 (c)(1)). A withdrawal for a period of time longer than 20 years would require an act of Congress.

Expand the Withdrawal Area to Include the Corridor along the Clarks Fork of the Yellowstone River in Wyoming.

Expanding the proposed mineral withdrawal into Wyoming is beyond the scope of the proposed withdrawal decision. The corridor along the Clarks Fork of the Yellowstone River in Wyoming is beyond the area consid-

ered "adjacent to" or "in the vicinity of" the New World Mine area and the New World Mining District. The interpretation for "adjacent to" and "in the vicinity" is defined by the *Federal Register* (September 1, 1995) withdrawal boundary, as well as by the New World Mining District described in the NWM Agreement.

Analyze the Withdrawal of 19,100 Acres of Federal Minerals

This was the size of the initial withdrawal proposal published in the *Federal Register* (September 1, 1995.) As described in Chapter 1 (Proposed Action), the area was expanded in response to concerns raised by the public during scoping and as a result of the NWM Agreement to better meet the purpose and need of this withdrawal.

TABLE 2-3 COMPARATIVE SUMMARY OF IMPACTS

Alternative A, No Mineral Withdrawal Scenario A-1: NWM Agreement Not Implemented	Alternative A, No Mineral Withdrawal Scenario A-2: NWM Agreement Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-1: NWM Agreement Not Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-2: NWM Agreement Implemented
Surface and Ground Water, Wetlands, and Floodplains			
<p>Mining-related effects would vary by scenario, based on probability of mineral development. General effects of mining could result in stream flow reduction and degraded ground-water quality. Changes in ground water would also affect surface water quality where water emerges in streams, springs, or seeps. Mining-related risks to water resources in this area include the potential for increased acid-rock drainage, the potential for ground-water contamination from underground mines, potential for failure of tailings impoundments, and uncertainty of mitigating effects to wetlands. Surface water quality would be closely regulated with storm water permits for non-point discharges. Special efforts would be necessary to meet water quality standards and non-degradation requirements. Mining could also result in the filling of wetlands and floodplains within the study area which has very limited availability of wetland mitigation sites.</p>			
Potential for impacts on surface and ground-water quality, wetlands, and floodplains would be greatest with the mining activities forecast in this Scenario. Impacts could occur on all three major drainages.	Potential for impacts on surface and ground-water quality, wetlands, and floodplains from mining activities would be much less than with Scenario A-1. Impacts may occur in either Stillwater or Soda Butte Creek drainage if a mine is developed.	Potential for impacts on surface and ground-water quality, wetlands, and floodplains from mining would be similar to Scenario A-1. Streams, wetlands, and floodplains on 17,760 acres withdrawn would not be at risk from mining. Some NWM facility sites would be withdrawn; remaining available locations may increase the risk to water quality and wetlands compared to Scenario A-1.	Mining would not be anticipated as a result of the proposed mineral withdrawal and the NWM Agreement. Potential impacts on surface and ground-water quality, wetlands, and floodplains would not be anticipated from mining.
Aquatic Resources			
<p>Mining-related effects would vary by Scenario, based on probability of mineral development. General effects of mining could affect fish and other aquatic life by reducing streamflow, increasing sedimentation, and changing water quality. These changes in some streams, e.g. Upper Fisher Creek and Daisy Creek, would have minimal effect on aquatic habitat and biota because they are already severely impaired from historic mining. Degradation of comparatively healthy streams, e.g. Miller Creek, the Broadwater and Clarks Fork Rivers, and Soda Butte Creek, would be more significant.</p>			
Potential for impacts on fish and aquatic life from mining would be greatest with this Scenario. Impacts could occur on all three major drainages.	Potential for impacts on fish and aquatic life from mining would be much less than with Scenario A-1. Impacts may occur in streams in either Stillwater or Soda Butte Creek drainage if a mine is developed. Potential for impacts on fish and	<p>aquatic life from mining would be similar to Scenario A-1. Impacts could originate on private land or federal land with valid claims on any of the three major drainages. Some NWM facility sites would be withdrawn; remaining available locations may increase the risk to aquatics compared to Scenario A-1.</p>	Mining would not be anticipated as a result of the proposed mineral withdrawal and the NWM Agreement. Potential impacts on fish and other aquatic life would not be anticipated from mining.

TABLE 2-3 COMPARATIVE SUMMARY OF IMPACTS (continued)

Alternative A, No Mineral Withdrawal Scenario A-1: NWM Agreement Not Implemented	Alternative A, No Mineral Withdrawal Scenario A-2: NWM Agreement Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-1: NWM Agreement Not Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-2: NWM Agreement Implemented
Recreation and Scenic Integrity			
<p>Mining-related effects would vary by Scenario, based on probability of mineral development. General effects of mining activities would change the recreation setting, recreation experiences, level of recreation use, and scenic integrity of the area. Mining would likely change recreation settings in semi-primitive areas to a roaded natural setting. Changes in noise, lighting, traffic, and local population caused by mining are also likely to change the recreation experiences. Overall recreation use would not be expected to change even though users seeking solitude and natural environments may be displaced. Improved local access roads, winter access, and increases in local population would increase use. Mining would likely change scenic integrity levels in areas of very high or high scenic integrity to levels of moderate scenic integrity. Depending on the location, mining related activities could be visible from wilderness areas or Yellowstone NP.</p>			
<p>Potential for impacts on recreation setting, recreation experiences, recreation use and scenic integrity from mining related activities forecast under this Scenario would be more likely than with the other Scenarios. Impacts would be most likely in the Lulu/Daisy Pass, 212 Corridor, Sheep Creek, Upper Stillwater, and Woody Creek recreation settings.</p>	<p>Potential for impacts on recreation setting, recreation experiences, recreation use and scenic integrity from mining forecast under this Scenario would be much less than under Scenario A-1. Impacts would be most likely outside the Lulu/Daisy Pass recreation settings.</p>	<p>Potential for impacts on recreation setting, recreation experiences, recreation use and scenic integrity from mining activities would be similar to Scenario A-1, but these impacts would most likely occur in the Lulu/Daisy Pass recreation settings. Semi-primitive recreation setting and opportunities on 17,760 acres would be maintained.</p>	<p>Mining would not be anticipated as a result of the proposed mineral withdrawal and the NWM Agreement. Potential mining-related impacts on recreation setting, recreation experiences, level of recreation use, and scenic integrity of the area would not be anticipated.</p>

TABLE 2-3 COMPARATIVE SUMMARY OF IMPACTS (continued)

Alternative A, No Mineral Withdrawal Scenario A-1: NWM Agreement Not Implemented		Alternative A, No Mineral Withdrawal Scenario A-2: NWM Agreement Implemented		Alternative B, Mineral Withdrawal Implemented Scenario B-1: NWM Agreement Not Implemented		Alternative B, Mineral Withdrawal Implemented Scenario B-2: NWM Agreement Implemented	
Yellowstone National Park							
Mining-related effects would vary by Scenario, based on probability of mineral development. General effects of mining in the study area could increase the need for staff, housing, road maintenance, and other services within the Park due to additional winter access and increased local population in the Cooke City/Silver Gate area. Park visitation would also increase at the NE entrance of Yellowstone NP if the highway between Cooke City, MT and Cody, WY is open all winter. Backcountry visitor experiences in the NE portion of the Park near the Park boundary could be affected by noise, night lighting, and other visual impacts. Mining could affect water quality and quantity in Soda Butte Creek which flows into the Park. Mining would continue as one of the identified threats that caused the World Heritage Committee to include Yellowstone NP on a list of World Heritage sites in Danger. Mining would not affect the Park's Biosphere Reserve designation.							
Potential for impacts on Park operations, Park visitation, visitor experiences, and World Heritage Site designation from mining related activities forecast under this Scenario would be more likely than with the other Scenarios. Lands adjacent to Yellowstone NP would remain available for mineral entry.		Potential for impacts on Park operations, Park visitation, visitor experiences, and World Heritage Site designation from mining forecast under this Scenario would be much less than under Scenario A-1. Lands adjacent to Yellowstone NP would remain available for mineral entry.		Potential for impacts on Park operations, Park visitation, visitor experiences, and World Heritage Site designation from mining activities would be similar to Scenario A-1. Lands adjacent to Yellowstone NP would be withdrawn from mineral entry.		Mining would not be anticipated as a result of the proposed mineral withdrawal and the NWM Agreement. Potential for impacts on Park operations, Park visitation, visitor experiences, and World Heritage Site designation from mining related activities would not be anticipated.	

TABLE 2-3 COMPARATIVE SUMMARY OF IMPACTS (continued)

Alternative A, No Mineral Withdrawal Scenario A-1: NWM Agreement Not Implemented	Alternative A, No Mineral Withdrawal Scenario A-2: NWM Agreement Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-1: NWM Agreement Not Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-2: NWM Agreement Implemented
Wilderness			
Mining-related effects would vary by Scenario, based on probability of mineral development. General effects of mining related activities would change the solitude, natural integrity, and primitive recreation experience available in wilderness areas surrounding the study area. Changes in nearby human activity, noise, dust, wilderness water quality, and night lighting caused by mining would also likely change the primitive recreation experience. Users seeking solitude and natural environments may be displaced.			
Potential for impacts on solitude, natural integrity, and primitive recreation from mining related activities forecast under this Scenario would be more likely than with the other Scenarios. Impacts would be most likely in Absaroka-Beartooth Wilderness west and north of the study area. Lands adjacent to wilderness would remain available for mineral entry.	Potential for impacts on solitude, natural integrity, and primitive recreation from mining forecast under this Scenario would be much less than under Scenario A-1. Impacts would also be less likely in the Clarks Fork or Stillwater watersheds due to the NWM Agreement. Lands next to wilderness would remain available for mineral entry.	Potential for impacts on solitude, natural integrity, and primitive recreation from mining activities would be less than with Scenario A-1 because mining would be concentrated in the center of the study area. Although 17,760 acres of federal land adjacent to wilderness would be unavailable for mining related activities, mining could affect water quality in the Clarks Fork and Stillwater Rivers which flow into the A-B Wilderness.	Mining would not be anticipated as a result of the proposed mineral withdrawal and the NWM Agreement. Potential impacts on solitude, natural integrity, and primitive recreation would not be anticipated from mining.

TABLE 2-3 COMPARATIVE SUMMARY OF IMPACTS (continued)

Alternative A, No Mineral Withdrawal Scenario A-1: NWM Agreement Not Implemented	Alternative A, No Mineral Withdrawal Scenario A-2: NWM Agreement Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-1: NWM Agreement Not Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-2: NWM Agreement Implemented
Roadless Areas			
Mining-related effects would vary by Scenario, based on probability of mineral development. General effects of mining related activities could change the natural integrity and apparent naturalness, the remoteness and solitude, and the manageability and boundaries of roadless areas.			
Potential for impacts on natural integrity and apparent naturalness, remoteness and solitude, and the manageability and boundaries of four roadless areas from mining related activities forecast under this Scenario would be more likely than with the other Scenarios. NWP may reduce the size of the Beartooth Roadless Area (RA).	Potential for impacts on natural integrity and apparent naturalness, remoteness and solitude, and the manageability and boundaries of three roadless areas from mining forecast under this Scenario would be much less than under Scenario A-1. The Beartooth RA probably would not be affected. Roadless acres remain available mineral entry.	Potential for impacts on natural integrity and apparent naturalness, the remoteness and solitude, and the manageability and boundaries of the portion of Beartooth Roadless Area near Fisher, Creek from mining related activities forecast under this Scenario would be similar to Scenario A-1. Reef, Republic Mountain RAs, and most of N. Absaroka RAs would be withdrawn from mineral entry and probably would not be affected.	Mining would not be anticipated as a result of the proposed mineral withdrawal and the NWM Agreement. Potential impacts on natural integrity, apparent naturalness, remoteness, solitude, manageability, and boundaries of roadless areas withdrawn from mineral entry would not be anticipated from mining.

TABLE 2-3 COMPARATIVE SUMMARY OF IMPACTS (continued)

Alternative A, No Mineral Withdrawal Scenario A-1: NWM Agreement Not Implemented	Alternative A, No Mineral Withdrawal Scenario A-2: NWM Agreement Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-1: NWM Agreement Not Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-2: NWM Agreement Implemented
Wild & Scenic Rivers			
Mining-related effects would vary by Scenario, based on probability of mineral development. General effects of mining related activities could change water quality, and outstandingly remarkable values of certain Wild and Scenic river segments. Most eligible or designated Wild and Scenic river segments are outside the study area. Mining upstream could degrade water quality if there are mine facility failures or ground-water contamination.		Mining would not be anticipated as a result of the proposed mineral withdrawal and the NWM Agreement. Potential impacts on water quality, free-flowing segments, and outstandingly remarkable values of Wild and Scenic river segments would not be anticipated from mining.	
Potential for impacts on water quality, free-flowing segments, and outstandingly remarkable values of Wild and Scenic river segments from mining related activities forecast under this Scenario would be more likely than with the other Scenarios. NWP may slightly change stream flows of Soda Butte Creek, Clarks Fork or Stillwater R. Scenic values of Stillwater R. within the study area could be affected.	Potential for impacts on water quality, free-flowing segments, and outstandingly remarkable values of Wild and Scenic river segments from mining related activities forecast under this Scenario would be much less than under Scenario A-1.	Potential for impacts on water quality, free-flowing segments, and outstandingly remarkable values of Wild and Scenic river segments from mining related activities forecast under this Scenario would be similar to Scenario A-1. Risks to water quality, free-flowing character, and outstandingly remarkable values of the Stillwater R. would be reduced due to the proposed mineral withdrawal.	
Air Quality			
Mining-related effects would vary by Scenario, based on probability of mineral development. General effects of mining related activities would cause particulate and gaseous emissions as well as visibility impacts that would effect overall air quality.		Mining would not be anticipated as a result of the proposed mineral withdrawal and the NWM Agreement. Potential impacts on water quality, free-flowing segments, and outstandingly remarkable values of Wild and Scenic river segments would not be anticipated from mining.	
Potential for particulate and gaseous emissions as well as visual impacts from mining related activities forecast under this Scenario would be more likely than with the other Scenarios. Emissions would likely not exceed Prevention of Significant Deterioration (PSD) or National Ambient Air Quality Standards.	Potential for impacts on air quality from mining related activities forecast under this Scenario would be much less than under Scenario A-1.	Potential for impacts on air quality from mining related activities forecast under this Scenario would be similar to Scenario A-1. Potential for air quality impacts to Yellowstone NP and wilderness areas would be reduced because mining would be concentrated in the center of the study area.	

TABLE 2-3 COMPARATIVE SUMMARY OF IMPACTS (continued)

Alternative A, No Mineral Withdrawal Scenario A-1: NWM Agreement Not Implemented	Alternative A, No Mineral Withdrawal Scenario A-2: NWM Agreement Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-1: NWM Agreement Not Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-2: NWM Agreement Implemented
Land Uses			
Potential metal production from known mineral reserves (New World Project) could include 2.3 MM oz. of gold, 8.8 MM oz. of silver, and 132 MM lb. of copper. Speculative production could include 2.6 MM oz. of gold, 10.0 MM oz. of silver, and 179 MM lb. of copper.	There would be no metal production from known mineral reserves. Speculative production could include 2.6 MM oz. of gold, 10.0 MM oz. of silver, and 179 MM lb. of copper.	Potential metal production would be the same as with Scenario A-1.	No metal production would be anticipated.
New World Mine Alternative would not be affected. Additional options could be developed on federal land available for mineral entry.	The New World Project would not be developed due to the NWM Agreement.	Three alternatives and other options for development and/or mitigation would be unavailable because of the mineral withdrawal. Alternative locations for sites on private land may be less environmentally desirable.	The New World Project would not be developed due to the NWM Agreement.
Private Land and Unpatented Mining Claims would not be affected.	The NWM Agreement may affect development of private land interspersed with interests acquired under the NWM Agreement.	Development of private lands and unpatented federal mining claims may be hampered by lack of available lands for mine facilities.	Mining development of remaining lands would be hampered by the lack of available land for facilities.

TABLE 2-3 COMPARATIVE SUMMARY OF IMPACTS (continued)

Alternative A, No Mineral Withdrawal Scenario A-1: NWM Agreement Not Implemented	Alternative A, No Mineral Withdrawal Scenario A-2: NWM Agreement Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-1: NWM Agreement Not Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-2: NWM Agreement Implemented
Economics			
Mining-related effects would vary by Scenario, based on probability of mineral development; however the following contains a description of general economic effects of mining. Employment and income would peak during mine development, decline slightly and level off during mine operation. Temporary jobs would be created by exploratory drilling operations, powerline construction, work camp construction, mine reclamation, plowing highways in the winter, building homes for employees, and highway maintenance. Costs to local governments would increase with increased demand for services as workers move to the area. County and local governments may experience budget shortfalls. Mining would increase economic diversity but not economic dependency. Mining and year-round access between Cody, WY and Cooke City, MT would tend to stabilize the Cooke City economy while the mine(s) operate. The level of economic impacts would depend on the number and size of mines developed.	The potential for mining-related economic impacts would be significantly reduced since the area of highest mineral development potential would be unavailable for mining due to the NWM Agreement.	Mining related economic impacts would be similar to Scenario A-1 due to anticipated development of the NWM.	The likelihood of mining and related economic impacts would essentially be eliminated.
Potential for economic impacts from mining related activities forecast under this Scenario would be more likely than with the other Scenarios.	Social		
Mining-related effects would vary by Scenario, based on probability of mineral development; however the following contains a description of general social effects of mining. Population would increase by about 50 permanent residents in the Cooke City/Silver Gate, MT area and by an estimated 360 permanent residents per mine in Park Co., MT, and Park Co., WY. Population increases would also occur from employment related to other activities. Demand for housing would increase, especially in Cody and Powell. Increased demands would be placed on schools, emergency services, domestic water, wastewater and solid waste disposal, and social services. Some infrastructure has little or no room to absorb the growth. Mining would alter the social character and quality of life in Cooke City and Silver Gate. Some social and cultural values would also change. The level of social impacts would depend on the number and size of mines developed.		Social impacts related to mining would probably be avoided. Social change would continue as the local communities grow, but at a much slower rate than if mining occurred.	
Potential for social impacts from mining related activities forecast under this Scenario would be more likely than with the other Scenarios.	The potential for mining-related social impacts would be reduced due to the NWM Agreement.	Social impacts would be similar to Scenario A-1 due to the development of the NWM.	

TABLE 2-3 COMPARATIVE SUMMARY OF IMPACTS (continued)

Alternative A, No Mineral Withdrawal Scenario A-1: NWM Agreement Not Implemented	Alternative A, No Mineral Withdrawal Scenario A-2: NWM Agreement Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-1: NWM Agreement Not Implemented	Alternative B, Mineral Withdrawal Implemented Scenario B-2: NWM Agreement Implemented
Cultural			
Mining-related effects would vary by Scenario, based on probability of mineral development. General effects of mining related activities could include damage or alteration to individual cultural sites. Increased use of the area or improved access to sites could also result in damage to sites and loss of the integrity of the New World Historic District (NWHHD).		Mining would not be anticipated as a result of the proposed mineral withdrawal and the NWM Agreement. Potential impacts on cultural resources, especially the integrity of the NWHHD would not be anticipated from mining.	
Potential for impacts from mining-related activities forecast under this Scenario would be more likely than with the other Scenarios. Activities would affect the integrity of the NWHHD.	Potential for impacts on cultural resources and especially the integrity of the NWHHD from mining related activities forecast under this Scenario would be much less than under Scenario A-1.	Potential for impacts on cultural resources, especially the integrity of the NWHHD from mining related actions forecast under this Scenario would be similar to those with Scenario A-1. Mineral development in the NWHHD would be likely.	
Wildlife			
Mining-related effects would vary by Scenario, based on probability of mineral development. General effects of mining related activities could cause loss of wildlife habitat, including grizzly bear habitat. Human caused mortality could also result from mining related activities.		Mining would not be anticipated as a result of the proposed mineral withdrawal and the NWM Agreement. Potential impacts on wildlife habitat and populations would not be anticipated from mining.	
Potential for impacts from mining-related activities forecast under this Scenario would be more likely than with the other Scenarios. Mineral activities in the high development potential areas could affect grizzly bear core habitat areas, elk and moose winter range, mountain sheep summer and winter range, and mountain goat range.	Potential for impacts on wildlife habitat and populations from mining-related activities forecast under this Scenario would be much less than under Scenario A-1. Grizzly bear core habitat would remain available for mineral development. Mountain sheep winter range would not.	Grizzly bear core habitat areas, elk and moose winter range, most mountain sheep summer range, and most mountain goat range would be withdrawn from mineral entry. Mining anticipated in central portion of study area would result in effects similar to Scenario A-1 if human activity and recreation use increases in important wildlife habitats.	

CHAPTER 3

AFFECTED ENVIRONMENT AND EFFECTS ANALYSIS

INTRODUCTION

This chapter describes the resources and values that could be affected by the alternatives under consideration. The resources and values discussed were raised as issues during scoping (See Chapter 1). Also described in this chapter are the environmental consequences that are anticipated from each alternative.

For each issue, the affected environment is described first. This is followed by a description of the anticipated environmental impacts of each alternative with and without the NWM Agreement (four scenarios). This organization is used to enable the reader to more easily understand the relationship between the affected environment and the anticipated environmental impacts of each issue. Where possible, the effects of the NWM Agreement are separated from the effects of a mineral withdrawal.

Included in the description of environmental impacts is a brief summary of the sources of potential environmental effects.

Nature of Effects Analysis

The mineral withdrawal analysis focuses on a policy level decision concerning the appropriateness of future mining on federal lands in the area considering other public values present. This broader look at the area differs from the "project level analysis" employed for the New World Project. As illustrated in Table 3-1, the project level analysis focuses on quantifying the effects on site-specific alternatives. The specific location and magnitude of effects can be quantified. For example, the sediment generated from the construction of 2 miles of road in the Daisy Creek drainage could be measured based on soil type, grades, road design, etc.

As a mineral withdrawal is a policy decision that does not result in surface-disturbing activities, there are no direct effects on water, wildlife, and other biological and physical resources in the study area. The environmental effects of mineral withdrawal alternatives are based on assumptions about potential development that could occur as described in the Forecast for Mineral Activity, Table 3-2. Environmental effects tend to be expressed in more general terms, focus more on changing trends, and are expressed more in terms of probable risks. These environmental effects are much less site specific and usually can not be quantified as well as the impact analysis of a site specific proposal. Site-specific effects of the New World Project (mine) are used as an example of potential mining-related effects.

TABLE 3-1: NATURE OF THE ANALYSIS

NATURE OF ANALYSIS	
Mineral Withdrawal (Policy Level Decision)	New World Project (Site Specific Project Decision)
Effects largely based on assumptions about future mineral development	Effects based on site-specific plans
Effects are described on area or drainage level	Effects are site-specific based on location of facilities
Effects less easily quantified; described in terms of change, risk, trends	Effects can be more easily quantified or measured

Forecast for Future Mineral Activity

For purposes of this analysis, a hypothetical model was developed to estimate future hardrock mining in the study area. This model, called the "Forecast for Future Mineral Activity" is summarized in Table 3-2 and is described in detail in Appendix B. The forecast considers the type of potential mining activity and the probability of occurrence, by Scenario. The forecast considered numerous factors such as quantity, grade, and location of known mineral reserves, the potential for other mineral occurrence in the area, land status, economics and mineral markets, mining technology, and the mining and environmental laws and regulations. The forecast is speculative in nature and is not meant to imply that the listed activities would actually occur. The forecast serves as a basis for evaluating the potential effects of a withdrawal on mineral resources in the study area, and it serves as a basis for assessing the potential effects of mining-related actions to area resources.

The mineral forecast varies depending upon whether or not there is a mineral withdrawal and the NWM Agreement. The forecast for each alternative and NWM Agreement Scenario are summarized below. Aside from the proposed New World Project, the location of future mineral development is speculative. Maps 2-1 through 2-4 depict where development is likely to occur with each alternative and with each NWM Agreement Scenario.

TABLE 3-2: FORECAST FOR FUTURE MINERAL ACTIVITY

	Alternative A No Mineral Withdrawal		Alternative B Mineral Withdrawal	
	Scenario A-1 NWM Agreement Not Implemented	Scenario A-2 NWM Agreement Implemented	Scenario B-1 NWM Agreement Not Implemented	Scenario B-2 NWM Agreement Implemented
Mines	• 2 Underground • 1 Surface	• 1 Underground • 0 Surface	• 2 Underground • 1 Surface	No mines
Probability of Development	• New World Project developed • 2nd Underground mine: > 1:50 • Surface mine: 1:10	• Underground mine: < 1:50	• New World Project developed • 2nd Underground mine: < 1:50 • Surface mine: < 1:10	
Exploration Activity	10 Operations	5 Operations	7 Operations	1 Operation
Location of Activity	Map 2-1; mostly private land	Map 2-2; mostly federal land	Map 2- 3; mostly private land	Map 2-4; private land

Mining-related actions

The effects of alternatives sections includes the term “mining-related actions.” Mining-related actions include:

- Prospecting, Exploration - access, drilling, geophysical exploration, trenching, pits, underground geophysical exploration, bulk sampling
- Development - drilling, development shafts and adits, access, power, communications, mine and millsite preparation
- Production - underground and surface methods, ore dressing, wastes, roads
- Reclamation

See USDA Forest Service General Technical Report INT-35 for a discussion of these actions. Mining-related actions for a major mine in the study area include workcamps, construction of a powerline into Wyoming, and plowing snow on previously unplowed segments of Highway 212 east of Cooke City.

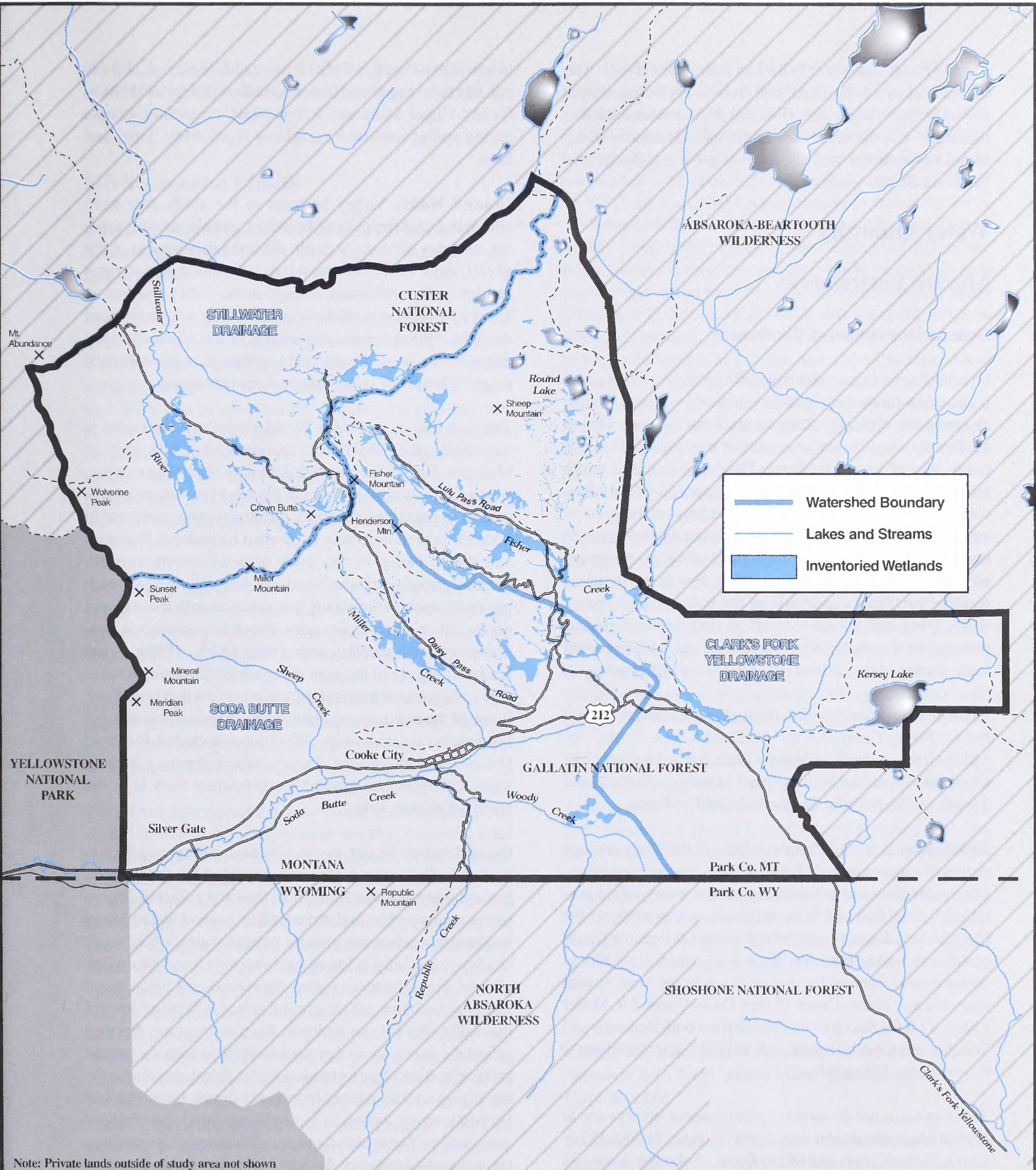
SURFACE AND GROUND WATER, WETLANDS, AND FLOODPLAINS

Introduction

This section considers the effects of the alternatives on water quantity (streamflow), legal availability of water, surface and ground-water quality, and wetlands and floodplains.

The study area includes the headwaters of the Stillwater River and Daisy Creek, the headwaters of the Clarks Fork and Fisher Creek, and the headwaters of Soda Butte Creek, including Miller Creek, Republic Creek, Woody Creek, and Sheep Creek (Map 3-1). A short segment of the Broadwater River, a major tributary of the Clarks Fork, flows through the southeastern portion of the study area. Study area watersheds are generally high, rocky, and steep, ranging from Sheep Mountain (10,616 feet) to the valley floor where Soda Butte Creek enters Yellowstone NP (7,360 feet).

Waters that originate in the study area flow into the surrounding A-B Wilderness and Yellowstone NP. Degradation of water quality for streams that flow into the adjacent wilderness or Yellowstone NP is not permitted under Montana and Wyoming water quality regulations. Portions of the Stillwater, Clarks Fork and Soda Butte Creek are



Note: Private lands outside of study area not shown

	Yellowstone National Park	Study Area Boundary
	Wilderness	Streams
	Private lands (not subject to withdrawal)	Trails
	National Forest Land	Roads
		National Forest Boundary

MAP 3-1

WETLANDS AND WATERS

OF THE U.S.

eligible rivers under the Wild and Scenic River Act. The Clarks Fork is a designated wild river in Wyoming, downstream from the study area. (Refer to Wild and Scenic River section of this document for additional discussion of affected environment and effects to eligible and designated Wild and Scenic Rivers).

Water Quantity

Affected Environment

General Description of Watersheds

Stream channels generally have riffle/pool sequences, with pools often formed by boulders or woody debris. Stream channels are typically steep to moderately steep, low to moderate sinuosity, low to moderate bankfull width/depth ratios, and of low to moderate floodplain/bankfull width ratios. Channel bed materials are composed of boulders, cobble, gravel, and sand. Stream channels on the granitic and sedimentary rock watersheds, lying in the north to northeast and middle portions of the study area, are generally stable, with streamflow and sediment in dynamic equilibrium. Stream channels on the volcanic rock watersheds, lying in the south to south to southwest and middle portions of the study area, are less stable, with sediment loads during spring snowmelt and intense rain storms.

Approximate drainage areas for study area streams are: 4.2 mi² for Fisher Creek, 1.4 mi² for Daisy Creek, 2.4 mi² for Miller Creek, 3.0 mi² for Sheep Creek, 6.6 mi² for Republic Creek and 5.4 mi² for Woody Creek at their confluence, and 1.9 mi² for Soda Butte Creek above Miller Creek.

Streamflow. Bankfull channel widths in the study area are defined by approximately 1.5 year recurrence interval flows, a frequent flow event occurring almost every other year which moves bed and bank materials, doing work on the channel, and depositing overbank sediment forming floodplains and valley bottoms. Estimated bankfull widths in downstream reaches for major assessment area stream channels are: Fisher Creek 15 feet, Daisy Creek 3 ft, Miller Creek, 17 ft for Sheep Creek 5 ft, 20 ft for both Republic and Woody Creek, Soda Butte Creek 10 ft, Broadwater River 30 ft, and Sedge Creek 8 feet.

These streams are formed by ground-water emergence in stream channels and/or seeps and springs. In like Daisy Creek, Fisher Creek, and Miller Creek, and other drainages where mining has occurred, some streamflow arises in mine adits where ground water has been intercepted. Many of the area springs and seeps form wetlands. Average annual flows in cfs (cubic feet per second), are: 3 cfs and 25 cfs for upper and lower Fisher Creek, 2 cfs and 12 cfs for upper and

lower Daisy Creek, 19 cfs for lower Miller Creek, 1.5 cfs and 68 cfs for upper and lower Soda Butte Creek, and 54 cfs for the Upper Stillwater River. Most streamflow occurs during spring snowmelt months of April, May, June, and July.

Ground Water. Valley bottoms in the study area have alluvial/glacial deposits of boulders, cobble, gravel, sand, silt, and clay. Ground water in the interstitial spaces of the gravel, sand, and coarser materials is common near streams and lakes. Ground-water storage in the valley bottoms is limited by relatively shallow depths of the alluvial/glacial deposits. Ground-water movement in the alluvial/glacial deposits can be relatively rapid, although many orders of magnitude slower than surface water movement.

The bedrock in the New World Project (NWP) area is described in the NWP PDEIS section 6.2.1 (USFS, State of Montana, 1996). The bedrock generally has low to medium permeability with areas of high permeability where weathered or in faults and fractures. Ground water movement in bedrock is predominately controlled by bedrock fractures and faults. Faults in the study area are nearly vertical, generally trend north-south and east-west. Northwest trending faults are less dominant, but coincide with the regional northwest oriented topography. Fracture patterns are generally oriented parallel with faults (Kirk, 1995). Some fracture systems in the area are conduits for ground-water flow, while others may be hydraulic barriers that limit flow. Some of the fractures are open and with the associated high head (several hundred to 2000') have potential for rapid groundwater movement. The dominant direction of geologic structures and ground-water fracture flow is in the north-south direction.

Ground water in the unconsolidated valley aquifers is hydraulically connected to, and recharged by, the bedrock ground-water system. Streams in the valley alluvial deposits are connected to, and recharged by ground water. Many headwater reaches are gaining ground water, while some reaches, especially in lower sections, may lose water to the alluvial ground-water system. Numerous wet areas in the valley sides occur where ground water is flowing toward the valley floor from bedrock fracture systems. Springs reflect the intersection of ground-water flow with the ground surface, and are often located on valley sideslopes above the streams as well as at toes of mountain slopes. Ground water supports many wetlands in seeps, springs, and shallow water tables. Some historic mine adits intercept groundwater, converting bedrock fracture water to surface flows.

Depths to ground water range from near ground surface in valley floors to as much as 300 feet below ground surface near the summit of Henderson and Fisher mountains. Water tables fluctuate seasonally from 2 to 10 feet, typically, with

delayed pattern flow pattern following the snowmelt peak and declining levels during summer/fall as snowmelt decreases.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under this scenario, all 22,000 acres of federal land in the study area remains available for mineral entry, and up to 4,160 acres of private land is available for mineral development. The Summary Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes the New World mine would be developed. In addition, there is a 10% probability of a surface mine and a 2% probability of a another underground mine. Up to 10 mineral exploration operations may occur. The area of likely mineral development is shown on Map 2-1.

Streamflow reductions in the study area are most likely to occur by groundwater interception into mine workings, thereby reducing discharge into area creeks, springs, and seeps. Based on section 7.2 of the NWP PDEIS, the 100 year low flow discharges in streams affected could be reduced by up to 15-20% during the life of the mine. Several types of groundwater mitigation, such as grouting, backfilling, or portal plugging could be used to reduce the groundwater interception and surface flow reduction.

During construction of the New World mine, ground water would flow into the underground workings, when a saturated fracture, joint, fault, or bedding plane is first encountered during blasting or excavation. Inflow may or may not continue from fractures, depending on connection to surface recharge. The NWP PDEIS section 7.2 estimates that average steady state mine inflow rates from mine workings (assuming no backfill or other ground-water mitigation) were estimated to vary from about 0.34 to 0.43 cfs (150 to 200 gpm). Overlying springs and ground water might be drained if fault zones act as ground-water conduits. This would be sufficient to reduce the ground-water table in portions of Henderson mountain. In addition, some of the ground water currently discharging directly to Miller and Fisher Creeks could be diverted into the mine workings, resulting in dewatering of portions of the existing aquifer. The New World mine proposal, for most of the alternatives, would discharge excess water to the Clarks Fork River. Net flow reductions to Soda Butte Creek would have to be augmented.

The NWP PDEIS, section 7.2 estimated, for 100 year low flow conditions, reduction in Fisher Creek of 0.32 cfs—0.7

cfs (14-30% low flow reduction) and a 0.12—0.15 cfs reduction (15 to 19%) in Miller Creek. These estimated flow reductions used the conservative assumptions that ground-water base flow would be affected to the full extent possible by 1) collection of Glengarry adit flows 2) no ground-water mitigation 3) half of the entire base flow of Fisher Creek in a 2,500' segment directly below the mine would be eliminated 4) and low flow in the east fork of Miller Creek would be eliminated during the life of the mine. Construction of an open pit mine in the analysis area (most likely in the McLaren and Como pit areas in upper Daisy and Fisher Creeks) could also intercept water in saturated fractures, joints, faults, and bedding planes. This water could be diverted to the mill circuit or treated and discharged but would result in additional flow reduction in adjacent springs and streams. Potential development of a second underground mine and an open pit mine would further increase ground-water interception and reduce streamflow and springs discharge in adjacent areas (primarily Fisher Creek and to a less degree Miller Creek).

Potential ground-water mitigation techniques include: grouting (particularly higher inflows fractures or faults), grout curtains, cutoff walls, seals and plugs, bulkheads, and mine backfill (concentrated slurry or paste backfill). The Environmental Protection Agency, in a review letter of preliminary drafts of this EIS, expressed concern that long term effectiveness of portal plugging in the study area is doubtful given the geo-chemical conditions and high head that could drive these flows through or around engineered solutions.

In addition to ground-water interception, water use associated with mining would include domestic use of water for mining, primarily wells associated with administrative facilities and work camps. Use of water for mining domestic purposes requires obtaining water rights through the State of Montana. Any appropriations for mining or domestic water use in the Soda Butte Creek drainage is subject to the National Park Service/Montana Department of Natural Resources and Conservation (DNRC) water rights compact discussed in the Legal Availability of Water section of this EIS.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under this scenario, 17,760 acres of federal land remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Summary Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes there is a 2% probability of an underground mine and the

potential for up to five exploration operations. The area of likely mineral development is shown on Map 2-2.

The New World mine would not be developed, and only minor exploratory drilling would be anticipated in areas not included in the agreement. The main streamflow effect would be cumulative effects due primarily to past mining activities which have altered ground-water levels in the vicinity of area adits, particularly the Glengarry and Gold Dust adits. If an underground mine is developed, surface flow depletion effects could be similar to the New World mine, depending on the location and extent of underground workings.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under this scenario, 17,760 acres of National Forest lands are immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims remain available for mineral development (Map 2-3). The Summary Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes the New World mine would be developed. In addition, there is a 10% probability of a surface mine and a 2% probability of another underground mine. Up to seven mineral exploration operations may occur. Up to 10 mineral exploration operations may occur. Area of likely mineral development is depicted on Map 2-3.

Ground-water interception and streamflow reduction effects could be similar to previously described for Scenario A-1 due to anticipated development of the New World mine. The area of highest mineral potential, located on private land and existing unpatented mining claims, remains available for mineral entry. Areas that remain available for mining are concentrated in the Fisher Creek and Miller Creek drainages. Additional exploration and development is possible; any such development would generate effects in addition to the anticipated effects from the NWP.

The proposed mineral withdrawal would immediately affect 17,760 acres of unclaimed National Forest system lands. The potential for ground-water interception, streamflow, and spring flow reduction due to mining in withdrawn portion of streams is reduced. For example, the withdrawal includes most of the Sheep, Woody, Republic, and Stillwater drainages.

Past mining activities have altered ground-water levels in the vicinity of area adits, particularly the Glengarry adit and McLaren pit. Development of the New World mine would have cumulative effects by further affecting ground-water

levels and flow direction in Henderson Mountain, Fisher Mountain, or other areas affected by additional mining. This alternative, by withdrawing the federal lands, would reduce the potential for additional stream flow reduction. No cumulative effects on water quantity are anticipated from the reasonably foreseeable activities identified in Appendix B.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under this scenario, 17,760 acres of unclaimed federal land are immediately subject to the mineral withdrawal and an additional 4,180 acres of Crown Butte's unpatented mining claims are withdrawn when the NWM Agreement is implemented. 60 acres of unpatented mining claims and 2,420 acres of private land remain available for mineral development (Map 2-4). The Summary Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes no mines would be developed and one exploration operation is possible. Area of likely mineral development is depicted on Map 2-4.

This scenario would reduce the potential for changes in water quantity from mine development. No water quantity effects from the estimated one exploration operation would be expected. This scenario would greatly constrain potential mineral development in the study area so the cumulative effects would be primarily the historic alterations of ground-water levels around adits. This Scenario would have the least effect on streamflow as it would result in only minor amounts of mineral exploration but no foreseeable mine.

Dewatering of Henderson Mountain and Fisher Mountain would not occur as no additional ground water would be intercepted beyond existing mine and exploration impacts and streamflow and spring discharge would remain essentially unchanged. Reclamation of historic mine disturbances, however, could reduce flow in the existing Glengarry adit. Adit flow reduction could elevate ground-water tables in upper Fisher Creek and form new springs which might offset the reduction in streamflow. No cumulative effects on water quantity are anticipated from the reasonably foreseeable activities identified in Appendix B.

Legal Availability of Water

Affected Environment

Water Right Claims

Water right claims in the study area have been filed for several uses including: mining, domestic, livestock, power

generation, recreation, and commercial. The Montana Water Court has issued a Temporary Preliminary Decree in the upper Yellowstone River drainage, which includes Soda Butte Creek to its headwaters. Silver Gate and Cooke City water use occurs primarily from springs.

Section 7.4 of the NWPPDEIS contains a listing of all of the surface water right claims for Fisher, Miller, Lady of the Lake Creek, Daisy Creek, and the upper Stillwater River. For several of the streams, particularly Fisher Creek and Lady of the Lake Creek, mining claims are much greater than measured flow rates, even during high flows. None of the claims have yet been adjudicated to rights by the Montana Water Court at which time the claimed amounts and/or diversion rates may be reduced based upon actual water use and availability.

Before mining water use can begin, mining companies would have to establish legal rights under the Montana Water Use Act for all direct surface and groundwater diversions and for indirect surface water depletion. Reduced flows in Fisher and Miller Creeks that harm downstream senior water users would need to be replaced. This could consist of transferring the consumptive use portion of existing water rights to unappropriated water available near the mining area.

The State of Montana has completed a water rights compact with the United States for Yellowstone NP (USDI, State of Montana, 1994). The compact defines the consumptive use and instream flow rights that the National Park Service (NPS) has on Soda Butte Creek. The water rights compact has closed the Soda Butte Creek basin to further appropriation except for a small amount of the creek flow which can be consumptively used. The NPS has instream flow rights for the entire flow of Soda Butte Creek, less any United States consumptive use rights. During low flow periods, the NPS has a right to maintain a critical level at the point where Soda Butte Creek enters Yellowstone NP. Only during the high flow month of June are new rights for consumptive use available in Soda Butte Creek.

The NPS instream flow rights for Soda Butte Creek are subordinate to certain existing and future surface and groundwater rights. During periods of less than normal flow, the NPS has a right to maintain a critical level of flow at the point where Soda Butte Creek enters Yellowstone NP. At such a time, subordination to consumptive uses only applies to domestic uses of 35 gpm or less, to any right held by either Silver Gate or Cooke City with a priority date before January 1, 1993, to any use considered non-consumptive as defined by the compact, and to any use of groundwater which is not connected to surface water flow within the basin. The low stream flows in Soda Butte Creek at the Park boundary at which subordination is limited are by month: January 5.4 cfs, February 5.1 cfs, March 4.0 cfs, April 1.7

cfs, May 116.9 cfs, June 332.5 cfs, July 120.7 cfs, August 46.4 cfs, September 15.3 cfs, October 14.2 cfs, November 9.9 cfs, and December 6.3 cfs (NWP PDEIS, section 7.3).

Depletion to and changes in the timing of streamflow of Miller and Soda Butte Creek would occur through the consumptive use of water by mining, or the transfer of water from the Soda Butte Creek basin to the Fisher Creek Basin. Because of the rights established by the water rights compact, any streamflow depletions or changes in timing in Soda Butte Creek at the Yellowstone NP boundary caused by the mine during construction, operation, or post mining would need to be replaced (except during months when appropriable water is still available) with water that would not degrade the water quality of the receiving stream. Mining companies would have two options to meet the requirements of the compact:

- purchase, lease, and retire existing water rights for such a purpose from the Soda Butte Creek basin or a nearby basin
- obtain new water rights to divert water for replacement from a nearby basin which is not fully appropriated

For existing water rights, mining companies could reduce the timing of the use or the amount of consumptive use of the water right by going through a change application process with the State of Montana.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under this scenario, all 22,000 acres of federal land in the study area remains available for mineral entry, and up to 4,160 acres of private land is available for mineral development. The Summary Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes the New World mine would be developed. In addition, there is a 10% probability of a surface mine and a 2% probability of another underground mine. Up to 10 mineral exploration operations may occur. The area of likely mineral development is shown on Map 2-1.

Direct and indirect effects of mine exploration on the legal availability of water relate to the need to establish water rights for mine activities and compliance with existing water rights commitments. The development of an underground mine on private lands and associated consumptive water use would require establishment of legal water rights

for all direct surface and groundwater diversions and for indirect surface water depletion.

Compliance with the NPS/Montana water rights compact in Soda Butte Creek would require augmentation of depleted flows to Soda Butte Creek or tributaries for all direct surface and groundwater diversions and for indirect surface water depletions. Augmentation would be required throughout the year with the possible exception of June for the interim range of flows in Soda Butte Creek. The NPS/Montana water rights compact, however, limits the amount of additional water available for domestic appropriation.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under this scenario, 17,760 acres of federal land remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Summary Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes there is a 2% probability of an underground mine and the potential for up to five exploration operations. The area of likely mineral development is shown on Map 2-2.

This Scenario would reduce the need to establish legal availability of water for mining compared to Scenario A-1 since the New World mine would not be developed. The risks of potential effects are reduced for the Fisher Creek and Miller Creek drainages due to the NWM Agreement. Other drainages in the study area remain available for mineral entry. Reasonably foreseeable activities in and near the study area could increase the consumptive use demand, particularly additional domestic and recreational development in the Silver Gate and Cooke City areas, and possibly consumptive water use associated with reclamation of historic mine disturbances. The NPS/Montana water rights compact, however, limits the amount of additional water available for domestic appropriation.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under this scenario, 17,760 acres of National Forest lands are immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims remain available for mineral development (Map 2-3). The Summary Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes the New World Mine would be developed. In addition, there is a 10% probability of a

surface mine and a 2% probability of another underground mine. Up to seven mineral exploration operations may occur. Up to 10 mineral exploration operations may occur. Area of likely mineral development is depicted on Map 2-3.

This Scenario would be similar to Scenario A-1 due to anticipated development of the NWM. The area of highest mineral potential remains available for mineral entry. Potential effects would be concentrated in the Fisher Creek and Miller Creek drainages. The mineral withdrawal reduces the potential for effects in drainages withdrawn from mineral entry.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under this scenario, 17,760 acres of unclaimed federal land are immediately subject to the mineral withdrawal and up to 1,700 acres of Crown Butte's private property interests and 4,180 acres of Crown Butte's unpatented mining claims are withdrawn when the NWM Agreement is implemented. 60 acres of unpatented mining claims and 2,420 acres of private land remain available for mineral development (Map 2-4). The Summary Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes no mines would be developed and one exploration operation is possible. Area of likely mineral development is depicted on Map 2-4.

The withdrawal of federal land in combination with the NWM Agreement reduces the likelihood of the need to secure the legal availability of water for mining. No new constructed mine diversions of surface and ground water are anticipated. Water would not likely be used consumptively for mining or domestic purposes by mining, nor would water likely be diverted from Soda Butte Creek and discharged into Fisher Creek. Additional minor water rights would likely not have to be obtained nor an augmentation plan developed to offset effects on senior water users or the water rights compact.

With the agreement, additional mine related water appropriations are not likely. Reasonably foreseeable activities in and near the study area could increase the consumptive use demand, particularly additional domestic and recreational development in the Silver Gate and Cooke City areas, and possibly consumptive water use associated with reclamation of historic mine disturbances. The NPS/Montana water rights compact, however, limits the amount of additional water available for domestic appropriation.

Surface Water Quality

Affected Environment

Water quality in the study area is affected by a diverse range of factors including geologic conditions and associated ground water/surface water interactions, and water chemistry types, historic mining effects, existing developments (roads, buildings, etc.) and disturbances (timber harvest, forest fires etc.), natural high sediment yielding events such as debris flows and landslides, and precipitation and streamflow variability. Several naturally occurring acid seeps and springs (from sulfate mineralization) are located in the upper Daisy, Fisher, and Miller Creek watersheds (Furniss, 1996). Historic mining disturbance has greatly accelerated acid rock drainage (ARD) in the study area.

Montana water quality standards, mandated by the Clean Water Act, direct the protection of beneficial water uses including aquatic life. Assessment area streams are classified by Montana as B-1 streams except for portions of the Clarks Fork and Stillwater River in the Absaroka Beartooth Wilderness, which are classified as A-1. The Montana B-1 classification states these waters are "... suitable for drinking, culinary and food processing purpose, after conventional treatment; bathing and swimming recreation; growth and propagation of salmonid fishes and associated aquatic life, waterfowl and furbearers; and agricultural and industrial water supply." No degradation of water quality is allowed in the wilderness portion of the Clarks Fork. In all B-1 classified streams, increases in concentrations of regulated parameters, such as sulfate, specific metals and lowering of pH, are limited to nonsignificant levels, depending on their potential for harm to human health and environment, including aquatic life.

All surface waters in the Wyoming portion of Yellowstone NP and in the Clarks Fork Wild and Scenic River are designated as Class I waters by the Wyoming Department of Environmental Quality (DEQ). The Wyoming regula-

tions require preservation of water quality. No new sources other than dams, may discharge, and no new existing point source may increase their discharge of pollutants into new waters so designated.

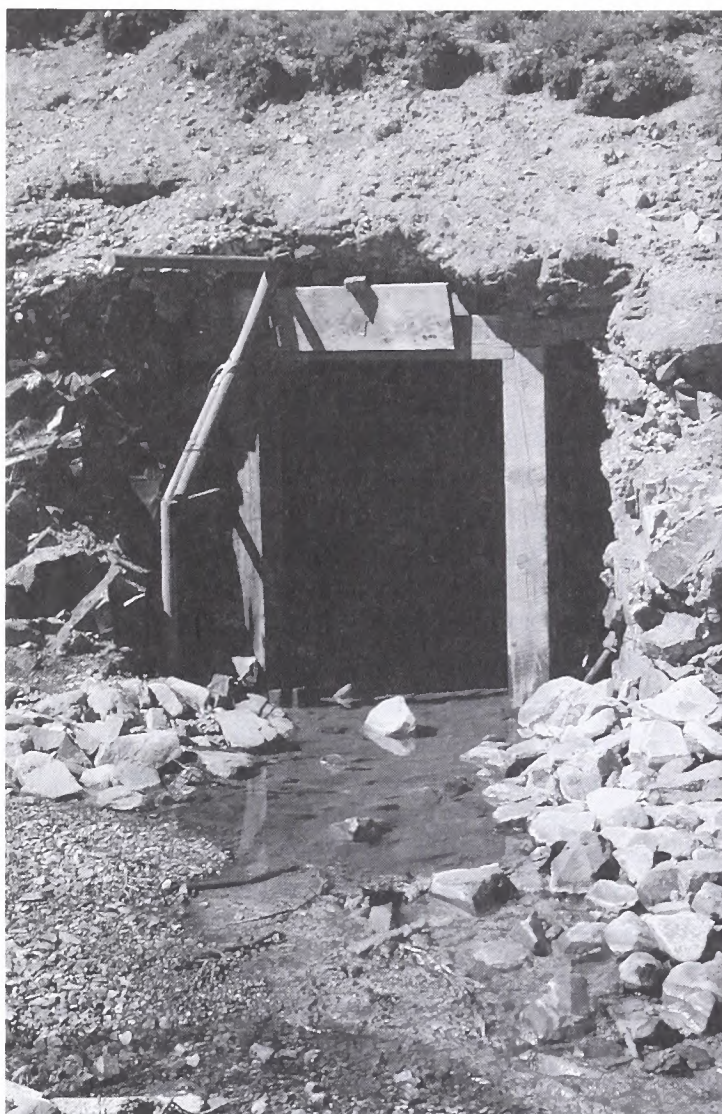
The Gallatin NF 305(b) Report (GNF, 1995), in response to Montana's listing of water quality impaired stream segments (Montana DHES, 1994), made recommendations that Daisy Creek and Fisher Creek be listed as water quality impaired throughout their lengths due to acidic and metal laden waters from mining. Soda Butte Creek was recommended for listing from the McLaren Tailings to Wyoming border, about 6 miles, due to acidic and metals contamination from the tailings. Recommended for changed listing of water quality impairment is the Clarks Fork as slightly impaired by mineralized waters from Fisher Creek for five miles from the Fisher Creek and Lady of the Lake Creek confluence forming the Clarks Fork, downstream to the Wyoming border. The Montana DEQ may require identification of total maximum daily loads (TMDL's) for Fisher, Soda Butte, and Daisy Creeks. The Montana Water Quality Act does not give DEQ specific authority to develop and implement TMDL's. The DEQ is seeking legislative authority, personnel, and funding to initiate a TMDL development process.

Reclamation of historic mining-related source areas in upper Fisher and Daisy Creeks, the McLaren Pit, Como Pit, and Glengarry Adit, potentially could improve water quality for meeting beneficial water uses. Reclamation of historic mining-related sources in Soda Butte Creek, notably the McLaren tailings, could improve water quality for supporting aquatic life in the immediate downstream reaches.

Surface waters in the study area are generally calcium bicarbonate types, except where sulfate-rich acidic drainage or naturally occurring sulfate-rich seeps and groundwater inflow result in calcium magnesium sulfate type water. Water chemistry varies by drainage basin, flow and proximity to mineralized areas and abandoned, historical mining sites. Section 7.5.2 of the NWP PDEIS contains a

Acid-rock drainage (ARD) is a term used to describe acidic leachate, seepage, or drainage that results from the breakdown or reaction of sulfide materials, such as pyrite or "fool's gold", when exposed to air and water. This breakdown or reaction of sulfide minerals occurs naturally at or near the earth's surface, as evidenced by the common presence of yellow-orange stains or deposits around exposed pieces of iron, marshy sediments, or at the edges of hot springs. ARD can also be generated in non-mining settings such as natural springs that may have pH's of near 2.0. Such springs usually are located in the vicinity of outcrops of sulfide-bearing rock. Bacteria present in most surface sediments greatly accelerate the ARD-forming processes. These reactions yield low pH (acidic), high sulfate water that has the potential to mobilize metals (most commonly iron, copper, aluminum, manganese, zinc, arsenic, and nickel) contained in the geological materials that are contacted.

The formation of ARD and resulting degradation of water quality usually do not occur in metal-sulfide minerals buried in the oxygen-poor environments under which they were formed. ARD can result when these minerals react with the oxygen in air, such as when they become exposed at the earth's surface during mining. Mine tailings, waste rock piles, drainage from underground working and open-pit pits are the main sources of ARD at mine sites. The development of ARD from mine-related sources may take years before it becomes noticeable, often long after mine closure.



Acid rock drainage from Glengarry Adit, upper Fisher Creek.

detailed description of chemical water quality of the study area streams in the New World mine assessment area. The McLaren Pit in upper Daisy Creek and Glengarry adit and Como Pit in upper Fisher Creek are acidic drainage metal enrichment sources. Acidic waters have elevated concentrations of aluminum, copper, iron, zinc, cadmium, lead and manganese which exceed chronic aquatic life standards in headwaters of Daisy Creek and Fisher Creek, and possibly in the immediate vicinity of McLaren Tailings in Soda Butte Creek. Floodplain sediments of Daisy and Fisher Creek have metal enrichment from historic upstream mine activity (Map 3-2).

Furniss (1996) has documented natural ferricrete deposition (9000+ years) from oxidative weathering of exposed sulfidic rocks in the upper Daisy, Miller, and Fisher Creeks. Daisy Creek and Fisher Creek headwaters have the most acidic and metal-laden waters of the study area due to natural mineralization and mining activity. Soda Butte Creek in the vicinity of the McLaren tailings also has acidic and metal-laden waters due to the sulfate and metals rich tailings. Miller Creek has some mine prospect activity with only minor headwaters effects of acidic drainage and metals (Map 3-2).

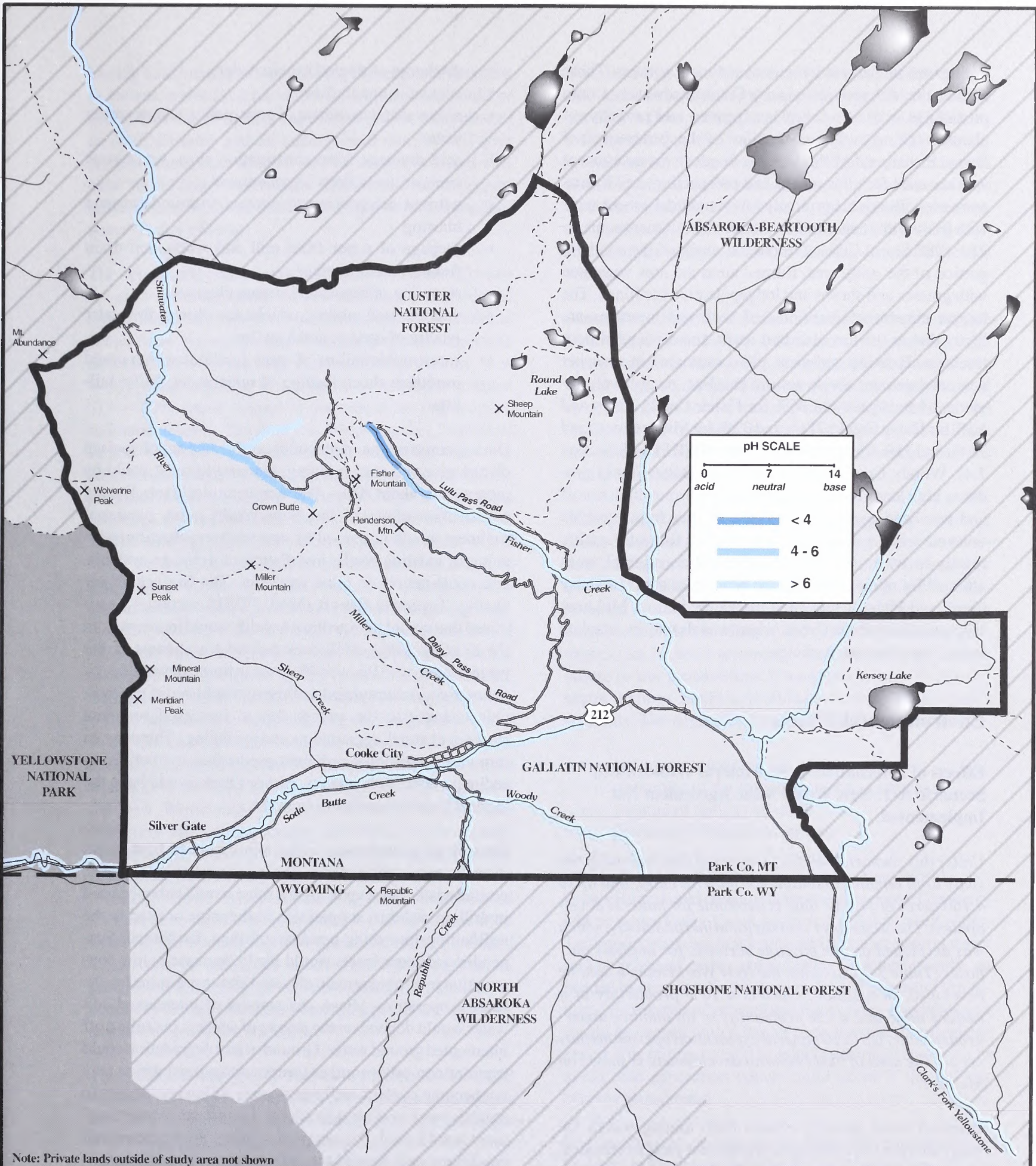
With increasing distance downstream, concentrations of sulfate and metals decline rapidly and pH and alkalinity increase due to inflow of good quality surface and groundwater, precipitation of Fe and Al oxides, and metal adsorption. Daisy Creek toxicity to aquatic life from acidic and metal-laden water is diminished by dilution at the confluence with upper Stillwater River. The Stillwater River largely recovers downstream by dilution from Goose Creek. Fisher Creek toxicity to aquatic life from acidic and metal-laden water is diminished and essentially recovered at the confluence with Lady of the Lake Creek, forming the Clarks Fork, which, when confluent with the Broadwater River, has barely detectable acid metal chemistry and healthy aquatic biota. Metal concentrations in Soda Butte Creek are elevated by the McLaren tailings which leach metal into the Creek, particularly when precipitation occurs on the tailings. Downstream water quality in Soda Butte Creek improves slightly with dilution from Miller Creek, then substantially from dilution from Woody Creek and Republic Creeks although abandoned mines and unmined lead deposits around the base of Republic Mountain and a pit of milled tailings, dating to the 1880's, are located near the confluence of Woody and Soda Butte Creek.

Ground-water Quality


In the study area in general, total dissolved solids (TDS) is low in ground water in the granitic bedrock system, intermediate in volcanic rocks, and high where sedimentary rock contains limestone. Calcium bicarbonate and sodium bicarbonate waters are common where sulfide minerals are not found. Natural concentrations of sulfide minerals as well as historically mined areas contain sulfate rather than carbonate as the major anion in ground water. Calcium/magnesium sulfate type ground water is found in the mineralized headwaters seeps and springs and historically mine affected areas of Daisy Creek and Fisher Creek. The headwaters of Miller Creek include a combination of carbonate and sulfate inflows, which are slightly affected by sulfide minerals and prospecting activity. Soda Butte Creek has some ground water affected by pyrite and other sulfide mineral mine tailings which are piled in and near the stream bottom and leaching from the McLaren tailings. The exposure of sulfide minerals to atmospheric oxygen and water leads to acidic ground water which dissolves or mobilizes metals such as iron, copper, aluminum, manganese, zinc, arsenic, and nickel. Acidic, high sulfate ground water with dissolved metals may be toxic to many aquatic and terrestrial lifeforms.

Sediment

Estimated existing sediment yields reflect natural geologic and soil erosion processes, such as the 1988 forest fires, as well as man-induced increases from roads, facilities, logging, and mining. Partially reclaimed waste rock piles and



Note: Private lands outside of study area not shown



Yellowstone National Park

Wilderness

Private lands (not subject to withdrawal)

National Forest Land

Study Area Boundary

Streams

Trails

Roads

National Forest Boundary

MAP 3-2

PH LEVELS IN AREA STREAMS

tailings are the largest individual sediment sources. These include the McLaren pit in Daisy Creek headwaters, Como pit tailings in Fisher Creek headwaters, and partially reclaimed tailings waste rock piles in the headwaters of Daisy, Fisher, and Miller Creeks. Roads in the assessment area are used for mine access and prospecting activity and recreation. Roads are typically low standard 4-wheel drive with limited drainage, and are frequently sediment sources. The 1988 Storm Creek fire burned much of the southern portion of the study area. Burned areas are now vegetated with grasses and shrubs and lodgepole pine seedlings. The largest amount of man-induced sediment increases are likely due to the low standard roads and associated poor drainage. Existing sediment yield estimates in tons per year, and percent above natural baseline, respectively include: 51 tons/year and 36% for Fisher Creek; 32 t/y and 60% for Daisy Creek; 21 t/y and 32% for Miller Creek; and 78 t/y and 31% for Soda Butte Creek (NWP PDEIS Section 7.4). Woody Creek (tributary of Soda Butte Creek) produces high loads of fine sediments during snowmelt runoff and localized high intensity rain storms from erodible volcanic soils. A major sediment concern for water quality relates to water chemistry in the sulfide mineral areas affected by mining, such as the headwater areas of Daisy Creek and Fisher Creek, and the valley bottom McLaren tailings in Soda Butte Creek, where metals may be attached to the fine sediment particles.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under this scenario, all 22,000 acres of federal land in the study area remains available for mineral entry, and up to 4,160 acres of private land is available for mineral development. The Summary Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes the New World mine would be developed. In addition, there is a 10% probability of a surface mine and a 2% probability of another underground mine. Up to 10 mineral exploration operations may occur. The area of likely mineral development is shown on Map 2-1.

Potential water quantity effects from mining within the study area consist of changes in sediment yield or chemical water quality from a variety of mining activities. Water quality in the study area could change due to direct and indirect mining effects from:

- construction of roads, mine building, workers camp, and other mine facilities
- discharge of treated excess water
- change in streamflow
- removal and treatment of poor quality adit or spring water
- acid drainage from construction sites, waste rock sites, or the tailings impoundment
- nutrient increase (mostly nitrates) from underground blasting
- seepage of water from mill and workcamp drain fields to surface water
- rerouting of runoff and stream channels
- underground mining, which may change the water quality of springs and baseflow
- catastrophic failure of mine facilities which could introduce shock loading of mine water and/or tailings

During construction, depending on the amount of surface disturbance and road building, stream sediment could be increased by about 30%—100% over natural levels. During construction phase of the New World mine, increased sediment would be caused by new road construction, widening of existing roads, installation of drainage systems, and construction of mine facilities. The Surface Water Quality Technical Report (NWP PDEIS section 4), estimated that cumulative sediment yields would increase from the existing 31%—61% over natural for streams in the project area to 31%—140% over natural depending on alternative. Accumulated sediments could cause geomorphic changes to the stream due to increased sediment storage, channel aggradation and widening. This may in turn cause additional sediment production by mobilizing sediment from streambanks. Fisher Creek would have the highest levels of sediment increase.

Intercepted ground water in the mine could be treated and discharged to surface water. During the operational phase, ground-water intercepted by the mine would either be used in drilling and dust suppression in the mine or used in the mill/tailings/polishing pond circuit then discharged. Suspended sediment levels would likely decrease below construction levels but remain elevated above pre-mine levels. In post operations phase, the amount of intercepted adit water would depend on the degree of success in sealing off intercepted ground water. Ground-water degradation could occur as non-point sources (seeps and springs) which may not become evident until many years following closure to underground mining operations. Long term water treatment would likely be required to meet discharge permit conditions and limitations, Montana water quality standards, and non-degradation limitations. Post operational sediment levels would gradually decrease to pre-mine levels as exposed soils harden and reclaimed areas revegetate.

During construction, water entering the adits and the mine, as well as water used for construction purposes, could be utilized, stored, or treated, and discharged. Development of an open pit mine and an underground mine would have construction effects which would be de-synchronized with New World mine construction effects but could be cumulative with New World mine operational or post operations water quality effects.

The operational phase would vary from 8 to about 20 years for each mine, assuming all three mines were developed (Appendix B Mineral Forecast). Water quality effects would occur from snowmelt runoff and stormflow impacting disturbed areas (roads and mine facilities). For the New World mine, increase in sediment is estimated at about 31%—60% above natural (a decrease from construction sediment levels). The Surface Water Quality Technical Report (NWP PDEIS section 2), contains an extensive analysis of streamflow and discharge mass loading and the potential water chemistry effects of New World mine discharge to area streams. During operation of the New World mine, ground-water inflows into the mine would either be piped to the mill or used in drilling and dust suppression. At the mill, lime would be added to mine water, then the water would be sent to the tailings impoundment. Most of the water in the tailings impoundment would be recycled for use as process water in the mill, with excess discharged using a pipeline and released into the stream through an effluent diffuser to promote mixing and avoidance of aquatic toxic concerns. The discharge point would be the Clarks Fork about a mile above the A-B Wilderness boundary. Some of the New World mine alternatives would discharge to the Stillwater River. The Crown Butte plan for the New World mine included collection of all of the Glengarry adit water, treating, and adding to the tailings impoundment water. Seepage water from the tailings impoundment would be returned to the tailings impoundment if treatment is necessary. A polishing pond would be used for final treatment (settling of solids and pH adjustment) of water before discharging. The Crown Butte plan included a provision of additional solids treatment (coagulation, precipitation, filtering, or various mechanical methods) as necessary to meet Montana water quality surface standards and non-degradation standards.

The Surface Water Quality Technical Report (NWP PDEIS section 2) estimated existing and projected water quality in the Clarks Fork river at a point about 1,500 feet above the A-B Wilderness boundary. During September low flow conditions, the discharge was projected to cause increases in concentrations of total dissolved solids, hardness, ammonia, and nitrate. Metal concentrations for all parameters analyzed (aluminum, cadmium, copper, iron, lead, and zinc), would be equal or less than existing concentrations at the Clarks Fork upstream from the wilderness boundary.

None of the projected increases were of sufficient magnitude to be considered water quality degradation in either low or high flow periods, as defined by the State of Montana (Montana DEQ, 1995). However, if concentrations remained higher than current conditions at the wilderness boundary and at the Wyoming boundary, there could be a violation of the State of Montana anti-degradation regulation for waters within Wilderness areas and Wyoming anti-degradation regulations for Outstanding Natural Resource Waters.

Some of the New World mine alternatives would capture Daisy Creek water into the mill circuit, treat, and discharge to the Stillwater River. The water quality in Daisy Creek would improve. In the Stillwater River, concentrations of total dissolved solids, sulfate, hardness, ammonia, and nitrate would increase due to discharge of the tailings impoundment water but loading of the 7 metals analyzed would be reduced.

Leakage or catastrophic failure of a tailings impoundment could occur due to inadequate design, improper construction, earthquakes, flooding, or avalanches. Section 3.4 of the NWP PDEIS contains an analysis of potential hazards, potential modes of failure, and mitigation. Stable facility location, durable liner design, and sound construction techniques can be used to manage leakage and catastrophic failure to low probabilities. If an impoundment failure did occur, tailings could contaminate surface water and/or wetlands. The degree of damage would be related to:

- tailings composition
- proximity of the impoundment to a stream
- volume of tailings released
- discharge of impacted streams

During the post operations phase for the New World mine, Crown Butte would continue to treat and discharge Glengarry adit or upper Daisy Creek water and tailings creek water. Tailings impoundment water would mix with natural water and be released, either continuously or intermittently, as needed to meet the discharge permit conditions and limitations. At the end of operations, the tailings impoundment would be capped with 4 feet of rock, topsoiled, and revegetated. The tailings would be kept in saturated condition to avoid acid generation which could occur if the tailings become unsaturated.

The quality of ground-water flow and springs from Henderson Mountain could be affected by the New World mine. Mine excavation, blasting, and backfilling would affect ground water within and downgradient of Henderson Mountain. Acid rock drainage might result from mine excavation due to exposure of sulfide minerals to water and oxygen. Blasting in the mine would temporarily increase

nitrate and ammonia concentrations. Backfilling of the mine could be used to reduce the potential for formation of acid rock drainage. Methods for mitigating changes in ground-water quality include removing the pyrite from the backfill, using a high density paste backfill, using bactericides to reduce acid generation, and plugging the mine adits at the end of the operation. Post operation sediment levels would gradually return to pre-mine levels as surface disturbance (roads and mine facilities) are reclaimed and revegetated.

Additional water quality effects in this Scenario could occur from a new open pit mine (probably in the Como and McLaren pit areas) or an underground mine. The additional impacts would depend on exact location, size, timing, mining technology, and mitigation used to deal with water resource impacts. Sediment effects would likely be cumulative to the sediment increases anticipated from the New World mine due to the longevity of some of the sediment sources (roads and facilities). Surface water chemistry effects would be less likely to be cumulative with New World mine discharge assuming discharge treatment is sufficient to meet Montana water quality standards and non-degradation constraints.

Additional cumulative effects could occur from historical or future activities. Past mining activities have altered water quality in study area streams, particularly Daisy Creek and Fisher Creek where low pH and concentrations of metals have severely degraded water quality. Reasonably foreseeable activities identified in Appendix C could be expected to result in cumulative surface water effects including: 1) reclamation of historic mining activities which could greatly improve water quality in study area streams and 2) reconstruction of Highway 212 from the Northeast Entrance to the Montana/Wyoming state line which could cause cumulative temporary sediment increases in Soda Butte Creek and the Clarks Fork in addition to those resulting from mining activities.

Mitigation of mining effects on surface water would be required through a combination of several techniques. Surface water mitigation would also be interrelated to the amount and effectiveness of ground-water mitigation. Surface water mitigation would need to incorporate all state and National Forest operating requirements and Best Management Practices (BMP's). All regulatory requirements would have to be met including water rights compact requirements, water quality standards, and non-degradation requirements.

Mine facilities site disturbance, clearing, tree removal, and site modification for mine facilities would be subject to Montana Forestry BMP's (Montana Department of State Lands, 1991) and Montana Streamside Management Zone Law and Rules (MT DSL, 1993). Disturbances on National

Forest lands would be required to be conducted in accordance with USFS (1988) Soil and Water Conservation Practices. These requirements include soil disturbance mitigation (waterbars, slash treatment), streamcourse and streamside protection, and disposal of hazardous or toxic material in a manner that would not pollute streams, lakes, or wetlands.

Road construction or reconstruction would be done in accordance with USFS (1988) and Montana Department of Natural Resources and Conservation, (DSL 1991 and 1993) road BMP's. These BMP's include use of soil stabilization and revegetation techniques such as mulch, cut and fill slope netting, seed and fertilizer, straw bale sediment traps, silt fences, slash filter windrows, energy dissipation structures, culvert discharge control, culvert downspouts, temporary dikes, and berms. Minimal disruption of natural drainage patterns would be required with the use of ditch relief culverts with armored discharge points, and road drainage routed through streamside management zones, filtration fields, or other sediment settling structures. Mine facility roads no longer needed for mine operations would have cut-and-fill slopes recontoured, ripped and subsoiled, thoroughly drained, slash or mulched applied on the surface, and revegetated.

Surface runoff would be diverted with interceptor ditches on the upstream of plant and mill sites, tailings impoundments, work camps, and waste water storage areas. This runoff would then be conveyed to original drainages. Surface runoff from mine facilities would be routed through sediment settling basins (not in stream channels) prior to disturbance. Final design of sediment control structures would require approval by Montana DEQ prior to construction. Stormwater runoff from disturbed areas would be regulated as part of the Montana Pollutant Discharge Elimination System (MPDES) discharge permit from the Montana DEQ. Runoff control ditches would be designed to safely pass a 100 yr-24 hr discharge. Sediment settling ponds would be designed to contain the 25yr-24hr runoff event.

Runoff from tailings impoundments would be contained in seepage control ponds that would include storage for the 100 year runoff event. Runoff from tailings impoundments would discharge only when a 100 yr-24 hour flow event is exceeded. Final designs must be approved by the Montana DEQ before construction.

Adit flows from the underground mine and mill water would be stored in surface impoundments (for the New World mine the tailings impoundment) with final treatment in a polishing pond for solids settlement and pH adjustment before discharge. If polishing pond water would not meet release criteria after settling, additional treatment would include various mechanical methods to ensure compliance

with Montana water quality standards and Montana non-degradation water quality requirements.

The mitigation measures associated with the regulatory framework in place to deal with potential adverse water quality effects (Montana and Wyoming water quality standards and non-degradation provisions, MPDES permits, stormwater discharge permits, road and mine BMP's and water protection design standards, reclamation requirements, wetland mitigation, etc.) if completely and successfully implemented, would protect water resources to regulatory standards. However, although mine operations have made massive efforts in recent years to comply with environmental standards, monitor water quality effects, and have developed much of the existing science and technology to deal with mine related environmental problems, departures from standards have occurred in Montana. Most recent departures are small except for a large settlement in July, 1996. A noncompliance penalty computation sheet, provided by the Montana Department of Environmental Quality, Hard Rock Division, lists the noncompliance violations which have occurred in Montana mines regulated by the Hard Rock Division during the period of 1991-1996. The sheet lists 38 violations for 24 mining companies, most of which are slight to moderate in seriousness. Most of the violations were from failure to obtain proper permits, reclamation problems, exceeding the permit area, and minor spills. Four of the violations listed involved spills, leaks, or unauthorized discharges to surface water but all were listed as moderate harm (\$100 to \$300 fine). The compliance sheet does not list any MPDES permit violations. However, a July 1996 consent decree for 2 gold mines in northern Montana contains provisions for a water treatment plant, construction of water capture systems, and other water conveyance systems for proper wastewater discharge, and a program of tiered effluent limits. The settlement includes a 2 million dollar civil penalty for discharges without an MPDES permit.

In the study area, the extensive mineralization and acid generation potential, combined with the difficult operating conditions result in a very challenging environment to extract mineral resources and comply with the strict non-degradation water quality standards. The EPA, during the PDEIS review of this EIS, questioned whether mining operations in the study area could meet the non-degradation water quality standards.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under this scenario, 17,760 acres of federal land remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1740 acres of private

mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Summary Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes there is a 2% probability of an underground mine and the potential for up to 5 exploration operations. The area of likely mineral development is shown on Map 2-2.

Water quality effects could be similar in nature but reduced in extent to Scenario A-1 for an underground mine or surface mine if developed. The New World mine would not be developed and only minor amounts of exploratory drilling with potential for a small underground mine on private land would be anticipated. Past mining activities have altered water quality in study area streams, particularly Daisy Creek and Fisher Creek where low pH and concentrations of metals have severely degraded water quality. Reasonably foreseeable activities identified in Appendix C could be expected to result in cumulative surface water effects including: 1) reclamation of historic mining activities which could greatly improve water quality in study area streams, and 2) reconstruction of Highway 212 from the Northeast Entrance of Yellowstone NP to the Montana/Wyoming state line which could cause cumulative temporary sediment increases in Soda Butte Creek and the Clarks Fork River in addition to those caused by mining activities.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under this scenario, 17,760 acres of federal lands are immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims remain available for mineral development (Map 2-3). The Summary Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes the New World mine would be developed. In addition, there is a 10% probability of a surface mine and a 2% probability of an another underground mine. Up to seven mineral exploration operations may occur. Up to 10 mineral exploration operations may occur. Area of likely mineral development is depicted on Map 2-3.

The NWM Agreement reduces the potential for mining-related effects to water quality. The New World Mine would not be developed and the area of highest mineral potential would no longer be available for mining. If a mine is developed on remaining lands available for mineral entry, the effects would be similar to Scenario A-1 depending upon the location and size of any mine. Lands that remain available for mining are concentrated in the Fisher Creek and Miller Creek drainages. The mineral withdrawal reduces the potential for mining-related effects to water

quality for streams subject to the withdrawal, including Republic, Woody, Sheep, and portions of the Stillwater River.

This Scenario would reduce the availability of adjacent federal land for NWP sites, and require facility development on private land and on existing, unpatented mining claims. This could result in more environmentally impactful locations for some of the NWP facilities, and increase the risk of adverse impacts to water quality compared to Scenario A-1.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under this scenario, 17,760 acres of unclaimed federal land are immediately subject to the mineral withdrawal. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. 60 acres of unpatented mining claims and 2,420 acres of private land remain available for mineral development (Map 2-4). The Summary Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes no mines would be developed and 1 exploration operation is possible. Area of likely mineral development is depicted on Map 2-4.

This Scenario has the greatest potential for water quality protection. Most of the anticipated indirect effects of this scenario would be improvements in water quality associated with reclamation of the existing historical mine disturbances. The withdrawal would reduce the probability of mining in the study area and the associated risk that water quality regulatory departures would occur. Water quality would be expected to be substantially improved in Fisher Creek with reduction or cessation in flow of the Glengarry adit. Cleanup would eventually increase pH and reduce the concentration of metals, sulfate, suspended solids, and dissolved solids. Continued reclamation of the McClaren pit would improve water quality in Daisy Creek and the West Fork of the Stillwater river. Sediment levels would decrease below current levels with rehabilitation of existing roads, exploration drill holes, and tailings.

Cumulative effects to water quality would occur from historical mining activities and from future development in the study area. Past mining activities have altered water quality in study area streams, particularly Daisy Creek and Fisher Creek where high pH and concentrations of metals have severely degraded water quality. Reasonably foreseeable activities identified in Appendix C could be expected to result in cumulative surface water effects including: 1) reclamation of historic mining activities which could greatly improve water quality in study area streams and 2) recon-

struction of Highway 212 from the Northeast Entrance of Yellowstone NP to the Montana/Wyoming state line which could cause cumulative temporary sediment increases in Soda Butte Creek and the Clarks Fork in addition to those caused by mining activities.

Wetlands and Floodplains

Affected Environment

Wetlands are found throughout the study area, especially where ground-water saturates portions of the lower mountain slopes. Wetlands are associated with numerous seeps and springs, with depressions accumulating snowmelt, and with streamside and lakeside areas. Map 3-1 shows the location of wetlands based on information from the NWP PDEIS, Section 9.2.1 but does not include wetlands for the entire study area. During the NWP PDEIS review, the Army Corps of Engineers, EPA, and National Park Service raised concerns about the adequacy of much of the wetland mapping. Additional wetland mapping work to address the concerns has not been completed since the New World mine EIS process was put on hold during August, 1996.

Study area wetlands have been categorized using the US Fish and Wildlife Service's Cowardin (1979) classification into three systems: riverine, lacustrine, and palustrine. The channels of Fisher, Daisy, Miller, Soda Butte, Republic, Woody, Sheep, and Sedge creeks and the Clarks Fork, Sedge, Broadwater, and Stillwater rivers are riverine systems. The named lakes like Kersey, Round, and Huckleberry, and the unnamed lakes and ponds, dominant in the northeast part of the study area, are lacustrine systems. The palustrine system includes herbaceous, shrub, and forested wetland types. Several dozen lakes and ponds (lacustrine wetlands) are located in the northeast part of the study area, on the southern edge of the Beartooth Plateau.

Herbaceous wetlands are often interwoven with shrub wetlands as willow and sedge meadows, such as in the upper Stillwater River below Daisy Creek, and numerous other valley bottoms in the study area. Some herbaceous wetlands are supported by deep organic soils and are referred to as fens. The wetland maps for the NWP PDEIS, Section 9.2 display several areas of fens in Fisher Creek and a few in upper Soda Butte Creek. An interagency field trip in July 1996 found several more fens not on the map. Fens are usually located in areas of cold ground-water upwelling that create a cool moist, micro-environment which retards decomposition and favors accumulation of organic material or peat. Fens are generally considered to be unique, although they are common within portions of the Greater Yellowstone Area. Fen peatlands are favorable potential sites for geo-chemical enrichment (accumulation of metals

and nutrients) due to the concentration of organic matter. Forested wetlands in the study area are dominated by subalpine fir with forested riparian streamside wetlands including Engelmann spruce.

Wetland functions include: ground-water recharge and discharge, floodflow alteration, sediment stabilization; sediment and toxicant retention, nutrient removal and transformation, production export of organic material, wildlife diversity and abundance, and aquatic diversity and abundance. Wetlands are also valued for recreation and aesthetics.

Wetlands can accumulate minerals, metals, and toxicants. The role of the wetlands in water quality changes in the two assessment area streams most impacted by historic mining, Daisy and Fisher creeks, has not been quantified. In both creeks, streamflow is generally confined to channel and limited overbank flooding occurs onto the herbaceous/shrub wetlands which can accumulate metals.

Waters of the U.S. include riffle and pool complexes as well as wetlands, both of which are considered special aquatic sites. Riffles are important sources of stream enrichment with atmospheric oxygen by turbulent mixing over the cobble/gravel substrates. Because of their oxygen rich waters and ideal substrate for aquatic lifeforms, riffles are major stream sources of aquatic insects and periphyton. Pools are excellent habitat for fish and other aquatic life and provides slow current areas where sediments can settle out of the water column. All study area streams have riffle and pool complexes with the exception of upper Daisy Creek.

Study area floodplains are bottom lands adjoining streams formed by overbank flows depositing silt, sand, gravel, and cobble. Floodplain regulations usually focus on floodplains occupied by 100 year flood events. Study area floodplains are generally narrow streamside zones, ranging from a few feet in small streams, 50 to 75 feet in Fisher Creek, and up to 300 feet in some reaches of the Broadwater River, Clarks Fork, Soda Butte Creek, and the Stillwater River. Floodplains in the assessment area are usually either forested with Engelmann spruce and subalpine fir or meadows with willow shrubs and sedges, and are typically also riverine wetlands.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under this scenario, all 22,000 acres of federal land in the study area remains available for mineral entry, and up to

4,160 acres of private land is available for mineral development. The Summary Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes the New World Mine would be developed. In addition, there is a 10% probability of a surface mine and a 2% probability of an another underground mine. Up to 10 mineral exploration operations may occur. The area of likely mineral development is shown on Map 2-1.

Mine development in the study area would fill some wetlands. Access roads, millsite and adits, tailings impoundments, and other mining facilities can be located to minimize wetland impacts but no practical alternatives to some wetland filling are available. In addition, mine development would discharge some fill material into study area streams, riffle and pool complexes, and floodplains.

The NWP PDEIS, Section 9.2 estimates that wetlands could fill from 21 to 81 acres, depending on the alternative. Most of the potential impacts are to herbaceous and shrub wetlands which would be filled by the tailings impoundment and associated diversions channel in Fisher Creek. The NWP PDEIS, Section 9.4 discloses that mine area streams could be affected by facility construction or tailings impoundments, estimated at 1,600 to 14,700 linear feet of stream depending on the alternative. In addition an estimated 28,300 to 30,900 feet of small ephemeral or intermittent drainages (in Fisher Creek and the East Fork of Miller Creek) were considered potentially at risk due to dewatering from intercepted ground water. The NWP PDEIS, Section 9.5 estimated that discharge of dredged or fill material into riffle and pool complexes would fill from 600 to 2,700 feet in Fisher Creek. Floodplains in Fisher Creek would also be filled in some New World mine alternatives.

Scenario A-1 could also include additional wetland impacts from a surface mine or additional underground mine.

Wetland disturbance would require mitigation of unavoidable direct and indirect adverse wetland effects by replacing the wetland functions lost as well as the wetland area lost. Scenario A-1 could have a high impact on wetland ground-water discharge function, sediment stabilization, wildlife diversity, and abundance, and a low impact of production export. Mitigation which cannot be accomplished on site and in kind would be considered an irretrievable commitment of resources. The Army Corps of Engineers (COE) and the EPA, which oversee the wetland protection provisions of the Clean Water Act, prefer wetland impacts be avoided if possible, then further minimized, and finally unavoidable effects compensated by restoration or creation of replacement wetlands and other waters of the US. A minimum of 1 to 1 acreage replacement and no net loss of wetland function and values would be required for a mining

company to obtain a Section 404 permit from the COE. The NWP PDEIS, section 9.6, lists 180 acres of potential wetland mitigation sites (on and off site) which have potential to compensate wetland acreage and function (primarily metals attenuation, wildlife habitat, ground-water discharge, and sediment retention). A detailed wetland mitigation plan was not developed for the New World mine pending identification of a preferred alternative in the NWP FEIS.

The COE, NPS, and EPA, in a review of the NWP PDEIS (April-July, 1996), did not concur that wetland function had been sufficiently identified. A multiple agency field review during July 1996 raised several concerns about the appropriateness and adequacy for wetland mitigation of several of the potential NWP mitigation sites. At the time of cessation of work for the NWPEIS (August 1996), wetland mapping refinement, more detailed function identification, more wetland mitigation site identification, and mitigation plan development was needed before a wetland 404 approval for the New World mine was feasible. Any future mine development under Scenario A-1 (New World mine or potential surface mine or additional underground mine) would require additional wetland analysis to augment the wetland information in the NWP PDEIS.

Past mining activities have affected study area wetlands, particularly riverine (herbaceous and shrub) wetlands in Daisy Creek and Fisher Creek. Reclamation of historic mining areas would reduce metal loading and improve water quality in downslope and downstream wetlands, streams, and riffle and pool complexes. Reconstruction of Highway 212 from the Northeast Entrance of Yellowstone NP to the Montana/Wyoming state line would cause cumulative impacts to wetlands, and ephemeral, intermittent, and small perennial streams by filling wetlands.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under this scenario, 17,760 acres of federal land remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Summary Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes there is a 2% probability of an underground mine and the potential for up to five exploration operations. The area of likely mineral development is shown on Map 2-1.

The New World mine and other potential mineral development on property interests acquired by Crown Butte would

not occur because of the NWM Agreement. The area of highest mineral potential, which includes wetlands in Miller and Fisher Creek, would no longer be available for mining. If an additional underground mine is developed on remaining lands available for mining the effects could be similar to those described for scenario A-1 depending on the location and size of a future mine. 17,760 acres of federal land remain open to filing of mining claims. Development of these lands could affect wetlands.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under this scenario, 17,760 acres of federal lands are immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims remain available for mineral development (Map 2-3). The Summary Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes the New World mine would be developed. In addition, there is a 10% probability of a surface mine and a 2% probability of an another underground mine. Up to seven mineral exploration operations may occur. Up to 10 mineral exploration operations may occur. Area of likely mineral development is depicted on Map 2-3.

Wetlands and floodplains effects of Scenario B-1 are similar to those described for Scenario A-1 because of anticipated development of the New World mine. The area of highest mineral potential, concentrated in the Miller Creek and Fisher Creek drainages, remains available for mining. Wetlands located on the 17,760 acres of federal land immediately subject to the withdrawal would not be affected by future mining.

This Scenario would reduce the availability of adjacent federal land for NWP facility sites, and require facility development on private land and on existing, unpatented mining claims. This could result in more environmentally impactive locations for some of the NWP facilities, and increase the risk of adverse impacts to wetlands and floodplains compared to Scenario A-1.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under this scenario, 17,760 acres of unclaimed federal land are immediately subject to the mineral withdrawal. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of

unpatented mining claims would be subject to the withdrawal when acquired. 60 acres of unpatented mining claims and 2,420 acres of private land remain available for mineral development (Map 2-4). The Summary Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes no mines would be developed and one exploration operation is possible. Area of likely mineral development is depicted on Map 2-4.

Scenario B-2 has the greatest potential for wetland/floodplain/pool and riffle complex protection. Only minor amounts of mineral exploration would occur but no foreseeable mine on federal lands. Fill of any waters of the US or special aquatic sites, such as wetlands, riffle and pool complexes, or floodplains would not likely occur as a result of mining. Existing wetland functions would not be affected by mining activities. Reclamation of historical mining disturbances would probably require filling minor amounts of herbaceous wetlands, particularly in upper Fisher and Daisy Creeks but could improve water quality inflows to wetlands. Reconstruction of Highway 212 from the Northeast Entrance of Yellowstone NP to the Montana/Wyoming state line would cause cumulative impacts to wetlands, and ephemeral, intermittent, and small perennial streams.

Conclusion

Neither alternative would have direct impacts to streamflow, water quality, legal availability of water, wetlands, floodplains, or air quality. However, the Scenarios evaluated in this EIS portray various levels of mine exploration, mining, and/or existing mine impacts which could occur depending on the amount of land available for mining. If the NWM Agreement is implemented, there would be much less potential for mining. Withdrawal of the federal lands would reduce the risk of adverse effects to water, wetlands, floodplains, and air quality. The regulatory framework in place to deal with potential adverse environmental effects (Montana and Wyoming water quality standards and non-degradation provisions, MPDES permits, stormwater discharge permits, Yellowstone NP/MT water rights compact, Yellowstone Controlled Groundwater area, road and mine BMP's and water protection design standards, COE Section 404 permit, wetland mitigation requirements, reclamation requirements, air quality standards etc.), if completely and successfully implemented, would protect water and air resources to regulatory standards. However, although mine operations have made massive efforts in recent years to comply with environmental standards, monitor water and air effects, and have developed much of the existing science and technology to deal with mine related environmental

problems, departures from standards have occurred. The withdrawal alternatives would reduce the probability or risk that water and air regulatory departures would occur.

Mining poses five main water resource issues including streamflow reduction, ground-water quality change, legal availability of water, surface water quality, and wetlands. Mines would intercept various levels of ground water in the fracture flow dominated mineralized areas. Depending on the effectiveness of ground-water mitigation measures to reduce ground-water interception (grouting, backfill, bulkheads etc.), downgradient ground-water flow could be reduced to some degree.

Minor streamflow reductions could result which would require augmentation to protect existing water rights, particularly in Soda Butte Creek which is protected with the NPS/MT water rights compact. Mining operations have the potential to change ground-water quality which could affect surface water quality when ground-water emerges in streams, springs, or seeps.

Ground-water change can be managed with underground mitigation but may require surface treatment. Ground-water quality effects are difficult to predict in advance and may not be evident for several years after a mine is in operation.

Surface water quality is closely regulated with storm water permits for non-point discharges, BMP's and engineering/project design standards, and MPDES permits for excess water (point) discharges. Careful implementation of mine operation, monitoring, and treatment techniques will be required to meet all of the water quality standards and non-degradation requirements in the study area.

The study area has a large and diverse wetland resource which is regulated by wetland protection provisions in the Clean Water Act (CWA). Mining operations have potential to fill area wetlands and floodplains by surface disturbance associated with development of mine facilities (roads, millsites, tailings impoundments, waste rock storage areas, workcamps, etc.). Wetland mitigation requires mapping of all wetland areas, determination of associated wetland functions, and rehabilitation or replacement of filled wetlands and displaced wetland functions. The study area has very limited availability of appropriate wetland mitigation sites which may necessitate wetland mitigation activities outside of the study area. Additional wetland mapping, function identification, and mitigation planning will be required for any potential mine in the study area to obtain a COE 404 permit for wetland impacts.

AQUATIC RESOURCES

Introduction

Issues

The lead agencies' analysis focuses on specific issues with the potential to affect aquatic habitat and aquatic biota. These issues are changes in physical habitat; changes in streamflow; changes in sediment loads due to potential future mining activities; and changes in water quality due to potential future mining activities.

Affected environment descriptions, both physical and biological, are tiered to the primary issues of concern. Descriptions are displayed by drainage for streams within the analysis area. Resource descriptions are general, not technical or highly site specific, because of the programmatic nature of the decision to be made. Descriptions of existing physical conditions include general stream channel and habitat characterizations, water quality, sediment, and streamflow. Existing biological communities, including aquatic algae, aquatic invertebrates, and fish are also summarized. For a more comprehensive discussion of the affected environment the reader is referred to *Chapter 8 - New World Project PDEIS* or the supporting *Aquatic Resources Technical Report - New World Project*. Existing physical and biological conditions then provide a basis from which to evaluate the effects of each alternative.

Causes of Change

The physical and chemical attributes of a stream provide the habitat framework for the development of the biological community. Physical attributes (e.g., stream gradient, substrate characteristics, channel dimensions) and chemical attributes (e.g., water quality) are basically products of the climate, geology and soils, topography, vegetation, hydrology and land use of a watershed. Changes in one or more characteristics due to future mining could potentially result in changes in the physical and chemical attributes of a stream, and lead to changes in the quality of habitat for aquatic life.

Affected Environment

Study Area

Three drainages and their streams originate within the proposed withdrawal area:

- Clarks Fork of the Yellowstone Drainage; including Fisher Creek, Lady of Lake Creek, the Broadwater River, and the Clarks Fork of the Yellowstone River (Clarks Fork) to the Wyoming border.
- Soda Butte Drainage; including Miller Creek, Woody and Republic creeks, Sheep Creek, and Soda Butte Creek into Yellowstone NP.
- Stillwater Drainage, including Daisy Creek, and the Stillwater River to the Goose Creek confluence.

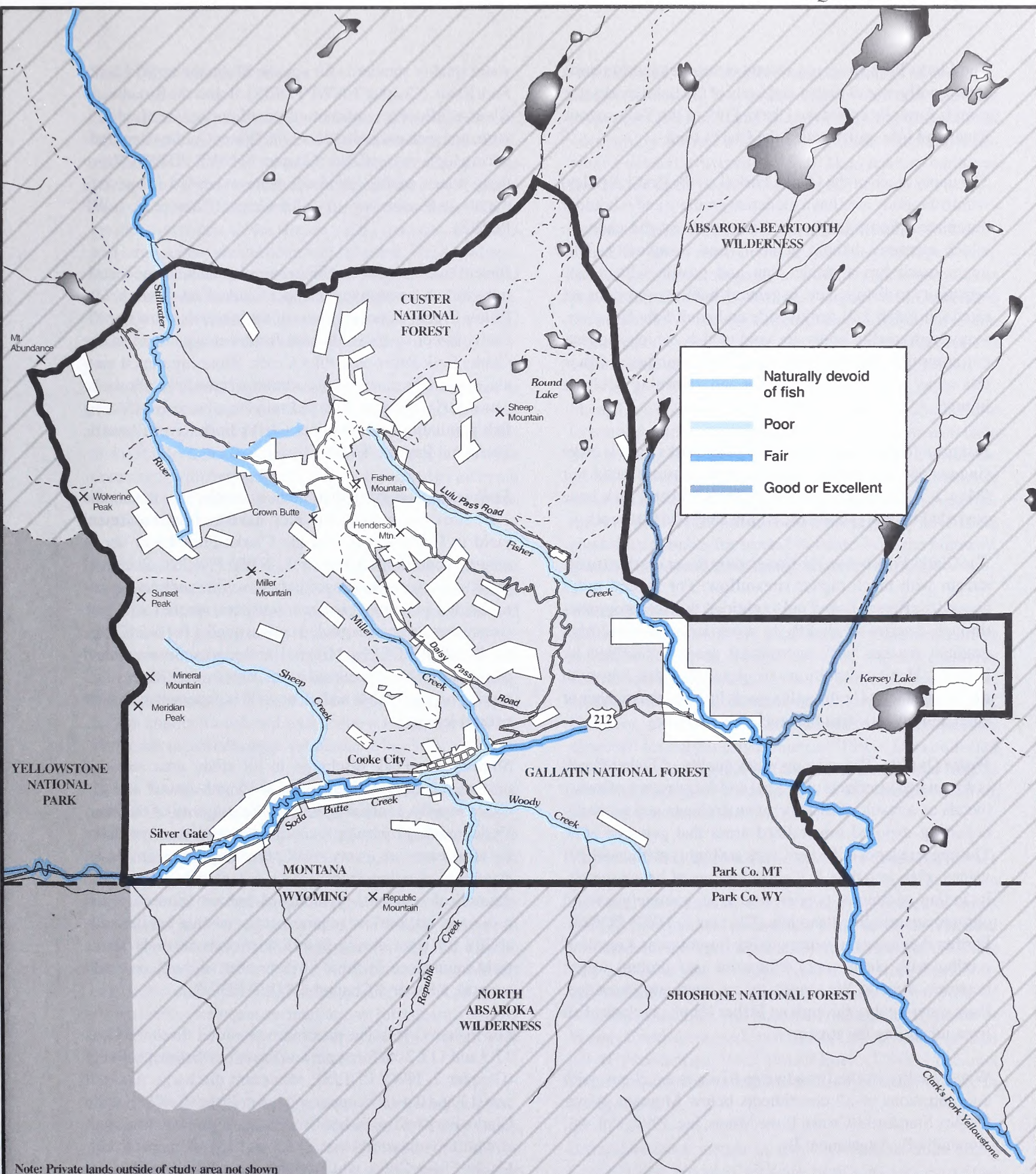
Physical Environment

Clarks Fork of the Yellowstone River Drainage

General Stream Channel and Habitat Characterization. Fisher Creek is a perennial first and second order mountain stream with headwaters originating below Fisher Mountain, Scotch Bonnet Mountain, and Lulu Pass. The entire stream is within the study area. The channel has moderate to steep gradients (e.g., 2-10%) with primarily boulder and large cobble substrates, but gradients and substrates vary among site specific reaches. In general, Fisher Creek has a stable plan and profile with low to moderate sensitivity to disturbance (i.e., changes in streamflow or sediment). The lower reach of the stream near its confluence with the Clarks Fork River is less stable and more sensitive.

Physical habitat conditions for fish (e.g., availability of high quality pools and instream cover, and the amount and quality of spawning habitat) in Fisher Creek are rated poor (Map 3-3; see also Aquatic Technical Report, New World Project (NWP)). Adult and juvenile habitat (i.e., pools) throughout the upper reaches is lacking, and would limit the number of fish it could support if water quality improved. Spawning habitat quality and availability would not limit recruitment in the upper reach. Habitat is more abundant for all life stages throughout the lower reach above the Clarks Fork River confluence primarily due to increased woody debris in the channel. However, the quality of habitat throughout this more sensitive reach has been degraded due to excessive fine sediment deposition from historic watershed disturbances.

The Broadwater River is a major second order tributary to the Clarks Fork and originates within the A-B Wilderness. The upper higher gradient reach is stable with predominately boulder substrates. The lower reach has a gentle gradient with predominately cobble and gravel substrates and is more sensitive to changes in sediment loads. Except for the 1988 fires, little watershed disturbance has occurred and habitat quality is reflective of natural conditions. Habitat quality for all life stages of fish is rated good to excellent (Map 3-3).



MAP 3-3

FISH HABITAT
CONDITIONS

The Clarks Fork River is a second order stream originating at the confluence of Fisher and Lady of the Lake creeks (the river is formally called the Clarks Fork of the Yellowstone River and informally called the Clarks Fork).

The upper reach of the Clarks Fork (i.e., the first 1.5 miles) within the study area has a moderate gradient and is boulder dominated. Some large wood is present in the channel, which increases habitat diversity and complexity. This upper reach has a stable plan and profile with a low sensitivity to disturbance. In general, habitat conditions are rated fair (Map 3-3) for juvenile and adult fish. However, many high quality pools are void of fish, which suggests that some other factor may be limiting the number of fish in this upper reach. Habitat for fry and spawning adults is limited.

Just prior to the Broadwater River, the Clarks Fork is more sinuous and less stable. Habitat conditions are rated fair (Map 3-3). High sediment loads from Fisher Creek have degraded habitat quality for all life stages in that reach.

The Clarks Fork below the Broadwater River is a third order stream with much higher streamflow. For several miles beyond the Kersey Lake Trail footbridge, the river progresses through a series of slightly to moderately confined high gradient reaches with intermittent reaches confined by bedrock. Habitat conditions are generally rated fair, with the overall lack of high quality pools limiting the number of adult and juvenile fish the reach can support.

Water Quality. The existing water quality of Fisher Creek is dominated by effects of low pH and the presence of heavy metals as a result of historic mine drainage and naturally occurring exposed mineralized areas that generate acid. The upper reaches of Fisher Creek are highly acidic with pH values often less than 4. Concentrations of heavy metals, including cadmium, copper, and zinc, routinely exceed chronic aquatic life standards (Chapter 7, NWP PDEIS). Further downstream, water quality improves as a result of mixing with clean water tributaries and ground water; however, aquatic life standards are routinely exceeded. Poor water quality throughout Fisher Creek precludes fish from inhabiting the stream.

Water quality in the Broadwater River is excellent, with concentrations of all constituents below Montana Water Quality Standards (Crown Butte Mines, Inc. 1992, Vol. 4A, Appendix B, Attachment B).

Water quality in the upper Clarks Fork River appears better than in Fisher Creek, primarily due to dilution with Lady of the Lake Creek, but is still affected by historical mine drainage. While pH is relatively neutral, water hardness and alkalinity values are low. These conditions can enhance the toxicity of metals. Copper concentrations routinely exceed

water quality standards for aquatic life in the upper Clarks Fork River. (Chapter 7, NWP PDEIS). Below the Broadwater River confluence, concentrations of copper, lead, aluminum, and zinc exceeded Montana Water Quality standards during high spring flows (Chapter 7, NWP PDEIS). Wyoming water quality standards were exceeded for several metals just upstream of Pilot Creek (Chapter 7, NWP PDEIS).

Recent studies show that bioaccumulated metal concentrations in fish are high in the upper Clarks Fork River below Fisher Creek. Concentrations of toxic metals were significantly lower in fish collected further downstream in the Clarks Fork River near Pilot Creek. Bioaccumulated metals, especially copper and cadmium, have been shown to cause toxic injury to fish and may be adversely affecting fish populations in the upper Clarks Fork River (Aquatic Technical Report, NWP).

Sediment. Historical disturbances, including roads, the 1988 fires, and mining activities, have increased sediment yield in Fisher Creek and the Clarks Fork River above natural conditions (Chapter 7, NWP PDEIS). Sediment yield increases have caused excessive fine sediment accumulations in lower gradient, sensitive reaches of those streams resulting in degraded habitat quality for fish (Chapter 8, NWP PDEIS). Minimal anthropogenic watershed disturbances have occurred in the Broadwater River (e.g., mining or roads), thus sediment yield is expected to be near natural levels.

Streamflow. Peak discharge in all study area streams, normally occurs during spring snowmelt runoff and declines rapidly, remaining low for the majority of the year. Under existing hydrologic conditions, minimum low flows for all streams are a very small percentage of mean annual flow (i.e., ranging from 1.2 to 6.7 percent). Based on theoretical relationships between habitat suitability and minimum streamflow requirements, existing habitat suitability for trout during baseflow periods severely limits trout abundance in those streams that support, or could support, a fishery (Chapter 8, NWP PDEIS).

For Fisher Creek, the maximum recorded discharge was 17.9 and 112.2 cfs for upper and lower reaches respectively (Chapter 7, NWP PDEIS). Minimum discharge reported was 0.1 and 0.4 cfs in upper and lower Fisher Creek. For the Clarks Fork below Fisher Creek, maximum and minimum streamflow measured was 273.3 and 1.0 cfs respectively. Unlike Fisher Creek, which tends to gain discharge along its course, the Clarks Fork loses water between its origin and the confluence with the Broadwater River. Maximum recorded high and low flows for the Broadwater River are 275.7 and 38.0 cfs respectively (Crown Butte Mines, Inc. 1992, Vol. 4A, Appendix B).

Soda Butte Creek Drainage

General Stream Channel and Habitat Characterization.

Miller Creek is a perennial stream with a moderate gradient, and is riffle dominated with infrequently spaced pools. The stream has a low sensitivity to disturbance with stable banks. Lower Miller Creek becomes more confined and its gradient increases as the stream valley narrows. Boulders and large cobble are the dominate substrate. High gradients in the lower reach prevent upstream migration of fish into the stream, and therefore the stream is naturally void of fish. Nonetheless, habitat conditions in the watershed are sufficient for a small resident salmonid fishery to exist.

Soda Butte Creek, from its headwaters near Colter Pass to the McLaren tailings near the Miller Creek confluence has a moderate gradient, primarily cobble and gravel substrate, and is stable with a low sensitivity to disturbance. It is riffle dominated with frequently spaced pools formed by instream woody debris. Habitat quality for fish and aquatic life in this reach is rated fair (Map 3-3).

From the McLaren tailings near the Miller Creek confluence through Cooke City to the Woody Creek confluence (about 3/4 mile), Soda Butte Creek has a moderate gradient and infrequently spaced pools formed by woody debris. Riparian vegetation is sparse throughout the tailings area. Stream substrates are coated with hydrated iron oxides resulting from acid drainage from the McLaren tailings. Overall habitat quality for fish and aquatic life is rated poor because of persistent acid drainage problems (Map 3-3).

Below the Woody Creek confluence, Soda Butte Creek meanders through a willow-shrub valley (about 4 miles). The stream is more sinuous with a lower gradient and has cobble, gravel, sand, and silt substrates. It is less stable and sensitive to changes in streamflow or sediment. Extremely high levels of fine sediment enter the stream from Woody Creek, much of which is deposited on medial and lateral point bars. Overall, habitat condition for fish and aquatic life is rated fair (Map 3-3). Abundant spawning habitat exists; however, spawning habitat quality is reduced due to excessive fine sediment accumulations. Infrequently spaced pools formed by woody debris and lateral scour provide limited habitat for juvenile and adult fish.

Woody Creek is a perennial second order stream originating in the North Absaroka Wilderness, WY, and enters Soda Butte Creek at the west end of Cooke City, MT. A water fall, approximately 100 ft. high, exists about 1.5 miles from its confluence with Soda Butte Creek. From the falls downstream the stream flows through a steep canyon and is very high gradient and stable. Pools scoured out of bedrock provide some habitat for fish. Above the falls, the valley opens into a high elevation cirque basin. Here the stream is

less confined, very unstable and the channel is predominately riffle with few pools. High water and sediment discharges resulting from frequent high intensity rainfall events have formed a channel with little structural complexity or habitat diversity for fish. Thus, habitat conditions for fish are rated poor.

Republic Creek is a perennial first order tributary to Woody Creek. Its lower reach is stable and flows through a steep canyon with moderate gradient. Boulders and woody debris provide suitable habitat for trout. Higher in the watershed the stream flows through a cirque basin with lower gradient. The stream is very unstable and large wood, boulders and some undercut banks provide limited habitat for trout.

Sheep Creek is a first order perennial tributary to Soda Butte Creek and enters approximately 1 3/4 miles upstream from Silver Gate, MT. In general, the stream has a moderate gradient, and is stable with primarily cobble and boulder substrate with a low sensitivity to disturbance. Approximately 1,000 feet of stream below the highway has habitat conditions suitable for trout. Upstream from the highway, gradient increases and habitat suitability declines.

Water Quality. Compared with Fisher and Daisy creeks, Miller Creek is relatively unaffected by historical mining activities. Based on limited data, pH appears relatively neutral and metal concentrations in Miller Creek are low, often below analytical detection limits (Hydrometrics, 1995). However, chronic aquatic life standards are occasionally exceeded for copper (Hydrometrics, 1995). Data collected by Del Nimmo suggests that copper concentrations may be affecting biological communities in the stream (Nimmo, personal communication 9/18/96).

Upper Soda Butte Creek above the Miller Creek confluence also tends to have relatively good water quality. Trace elements are primarily below analytical detection limits and physicochemical parameters indicate water is neutral and moderately hard. As Soda Butte Creek enters Cooke City and flows past Woody Creek, runoff from the historical McLaren tailings, abandoned mines at the base of Republic Mountain, and historical tailings at the mouth of Woody Creek increases metal concentrations and decreases pH (Hydrometrics 1995, Van Gosen, USGS, personal comm.). Data is not available to describe water quality in Sheep Creek.

Bioaccumulated metals in fish collected in Soda Butte Creek below Woody Creek are similar to concentrations found in fish from the upper Clarks Fork River site (Aquatic Technical Report - NWP). Bioaccumulated metals, especially copper and cadmium, at concentrations found, have been shown to cause toxic injuries to fish and may be adversely affecting fish populations in Soda Butte Creek.

Sediment. Like the Clarks Fork drainage, existing roads and historical mining activities have contributed to elevated sediment loads in streams throughout the upper Soda Butte Creek drainage. Woody and Republic creeks, in particular, contribute extremely high levels of sediment to Soda Butte Creek. The Woody Creek watershed has a high percentage of extremely erosive soil comprised of glacial till derived from volcanic rocks (Shovic et. al. 1988). High snowmelt rates and summer thunderstorms readily erode the steep volcanic cirque headwalls and scarps to form a dense dendritic drainage pattern of intermittent channels that carry high sediment loads. For example, sediment discharge from one intermittent trough wall tributary to Woody Creek was measured at 114,960 tons/day after a heavy day-long rain (Shovic et. al. 1988). These high sediment loads reduce channel stability and habitat quality for all life stages of fish in Soda Butte Creek.

Streamflow. For Miller Creek, maximum and minimum recorded streamflows between 1989 and 1993 were 48.7 and 0.43 cfs respectively. In Soda Butte Creek above the Miller Creek confluence, streamflows ranged from 1.4 to 29.4 cfs. Discharge increases substantially beyond the Woody Creek confluence with Woody Creek contributing approximately 70 percent of the flow. No discharge data is available for Sheep Creek.

Like streams in the Clarks Fork drainage, habitat suitability for trout in streams throughout upper Soda Butte drainage is reduced due to extreme low flows.

Stillwater River Drainage

General Stream Channel and Habitat Characterization. Daisy Creek is a perennial first order mountain stream originating from springs, seeps, and some flow from the McLaren pit below Fisher Mountain. It is a high gradient, stable stream with predominately boulder and cobble substrates. Substrates are coated with hydrated iron oxides resulting from acid drainage from the McLaren pit. Habitat conditions for fish are poor due to steep gradients and poor water quality (Map 3-3).

The Stillwater River below Daisy Creek meanders through a willowed valley bottom for about 1 mile to the A-B Wilderness boundary. The low gradient channel is moderately stable with cobble, gravel, sand, and silt substrates. Hydrated iron oxides coat the stream bottom and degrade habitat for aquatic life. From the wilderness boundary downstream to the Goose Creek confluence the stream flows through a steep narrow canyon and over several falls that are barriers to upstream fish movement. Channel stability is rated high and substrate is primarily boulder. Habitat

conditions for fish are rated poor due to steep gradients and poor water quality. The most downstream barrier falls is located about 200 yards upstream from the Goose Creek confluence. No fish inhabit the Stillwater River above the barrier falls, and this portion of the drainage is considered naturally void of fish. Thus, issues regarding water quality, sediment, streamflow and associated direct effects on aquatic habitat and biota pertaining to the Stillwater River upstream from the falls are related primarily to aquatic insects. Habitat conditions for fish and other aquatic life improve downstream from Goose Creek as water quality improves and gradients are less steep.

Water Quality. Like Fisher Creek, Daisy Creek water quality is characterized by low pH and elevated heavy metal concentrations from the McLaren pit and other historical mining disturbances. More alkaline water in Daisy Creek may moderate the toxic effects of some metals; however, data suggest aluminum, copper, manganese, and zinc may regularly exceed water quality criteria.

The Stillwater River is less severely affected than Daisy Creek (Chapter 7, NWP PDEIS). Above the Daisy Creek confluence, the Stillwater River has fairly neutral pH with moderate hardness and alkalinity. Physiochemical parameters change as water from Daisy Creek enters the stream; pH, hardness, and alkalinity values all decline. Trace metal analyses indicated that copper and zinc may occasionally exceed water quality criteria below Daisy Creek.

Sediment. Historical mining activities, primarily the McLaren pit, have contributed to elevated sediment loads in Daisy Creek and the Stillwater River (Chapter 7, NWP PDEIS). High levels of fine sediment deposited in the upper low gradient reach of the Stillwater River further degrades habitat quality and reduces the biological health of that reach. Less fine sediment is deposited in the reach throughout the wilderness because of higher gradients.

Streamflow. Daisy Creek is a perennial stream that drains the Fisher Mountain, Crown Butte, and Daisy Pass area. Small tributaries, influx from ground water, and surface flow from the historical McLaren pit contribute to the Daisy Creek discharge. Near the headwaters of Daisy Creek, streamflow measurements have ranged from 0.1 to 12.5 cfs (Chapter 7, NWP PDEIS). Farther downstream flows in Daisy Creek ranged from 0.4 to 57.0 cfs.

Several large springs and tributaries, including Daisy Creek, form the headwaters of the Stillwater River. Discharge records show flows range from 1.7 to 157.6 cfs (Chapter 7, NWP PDEIS).

Aquatic Biology

Clarks Fork Yellowstone River Drainage

Algae. Aquatic algae are often used to describe the biological condition of stream systems because:

- they can be indicators of short-term effects due to their rapid reproduction rates and short life cycles;
- they can be directly affected by physical and chemical factors;
- they are relatively easy to sample;
- standard methods for community evaluation are available; and
- these algal communities can be sensitive to pollutants (Plafkin et al., 1989).

Algae in mountain streams are basically represented by two groups, soft-bodied algae and diatoms, collectively referred to as periphyton. The periphyton community for many streams in the study area were assessed using the methods described by Bahls (1993), and results are described in detail in the Aquatic Technical Report for the New World Project. Basically, indices calculated for each stream provide a basis for assessing the degree of impairment.

Periphyton from Fisher Creek, Lady of the Lake Creek, and the Clarks Fork River were rated moderate to severe for overall impairment, possibly as a result of elevated levels of heavy metals. In addition, periphyton communities also may be limited by physical habitat conditions typically found in high mountain streams, including low nutrient concentrations, flushing flows from storms and snowmelt, and cold temperatures (Aquatic Resources Technical Report, NWP) (Map 3-4). Periphyton indices have not been calculated for the Broadwater River.

Invertebrates. Aquatic invertebrates are also commonly used to monitor stream systems. Sensitive species in mountain stream communities generally include mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera), which are often referred to as the "EPT" taxa. Impairment of aquatic communities can be assessed by comparing conditions at potentially affected sites to conditions at nearby "unaffected" sites. Sites considered to be unaffected often have greater total abundance and number of species, including the sensitive EPT taxa, when compared to sites affected by heavy metals.

The agencies used three metrics to assess the existing conditions of aquatic invertebrate communities in the study area (total abundance, Heptageniidae abundance, and EPT taxa). These three metrics have been reported to be particularly useful for assessing metals contamination (Clements, 1994; Clements and Kiffney, 1995).

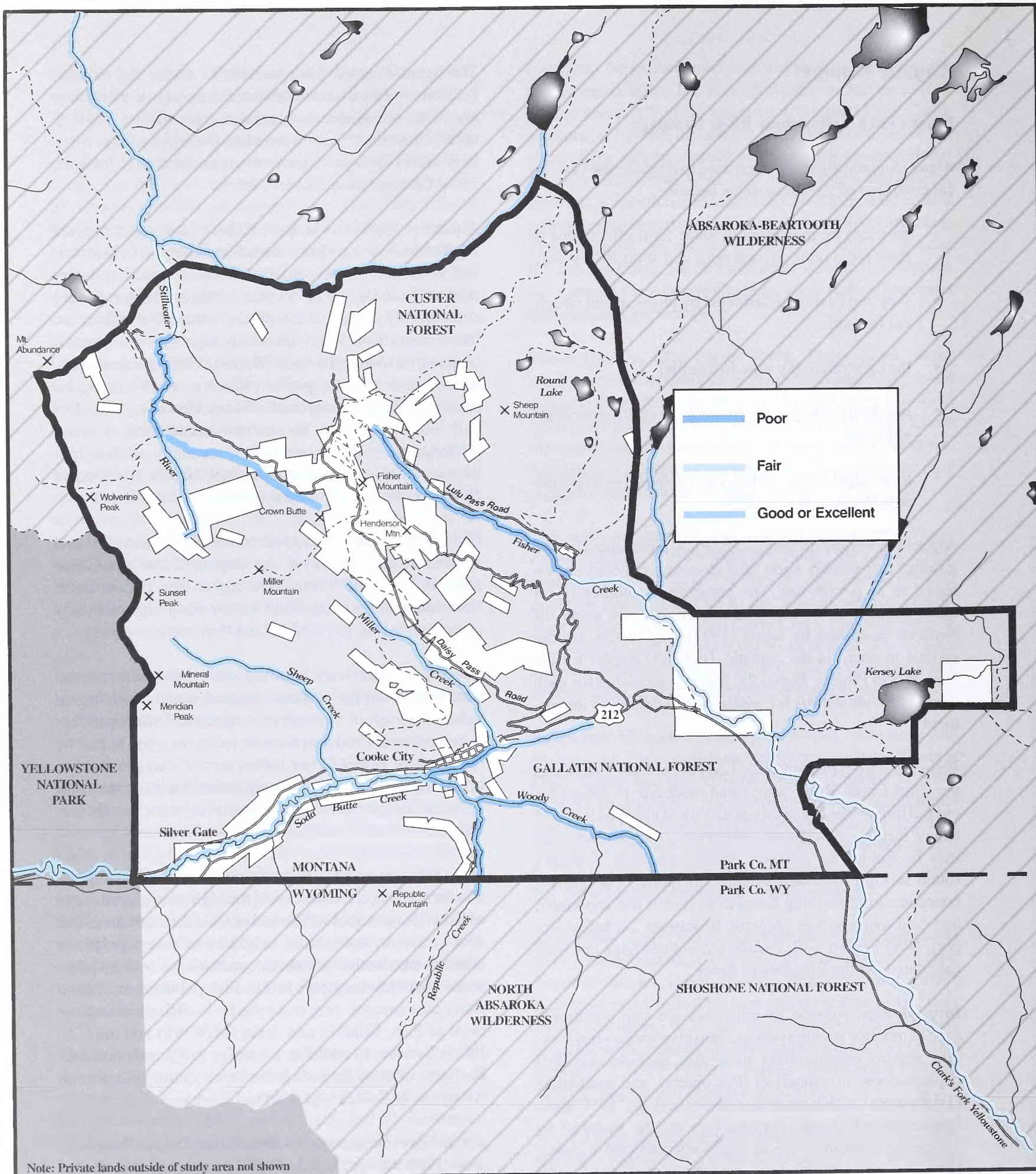
Aquatic invertebrates in upper Fisher Creek reflect stressed conditions, with very low values for all metrics. In comparison, data from Scotch Bonnet Creek, a nearby tributary relatively unaffected by historical mining, the metrics are considerably higher, although the values still reflect the harsh conditions often found in high altitude streams (Aquatic Resources Technical Report, NWP). Farther downstream, data indicate partial recovery, as shown by increased total abundance and EPT taxa. However, these data still indicate that the invertebrate community is under moderate stress. The invertebrate community, while exhibiting greater abundance, is composed largely of orthoclad chironomids; insects often considered metal tolerant.

Lady of the Lake Creek exhibited moderate densities and number of taxa. However, the Heptageniidae abundance and number of EPT taxa were higher than Fisher Creek sites, indicating a community typical for a high mountain stream subject to physical habitat limitations.

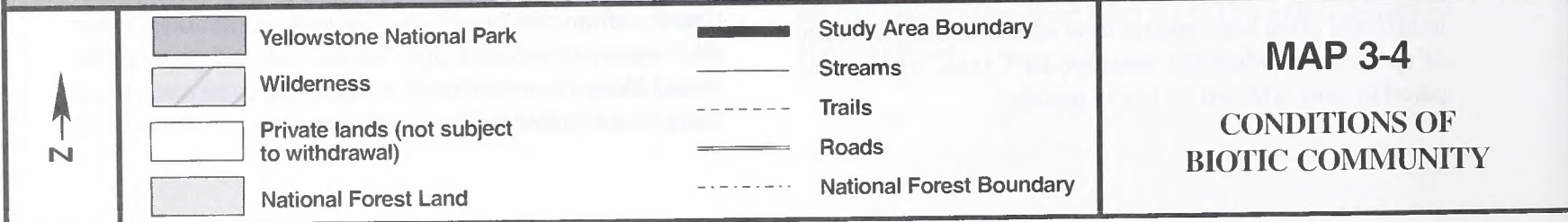
The Clarks Fork river data suggest a trend of improved conditions from the upstream to downstream, with higher values for each of the metrics evaluated. Differences between upstream and downstream locations may, in part be the result of Fisher Creek inflow and/or changes that are often associated with natural longitudinal variation in stream systems. No invertebrate data is available for the Broadwater River.

Fish. An assessment of fisheries resource health is imperative for this project, considering the high recreational value of fisheries resources within and outside the study area. The size, structure, and relative condition of fish populations allow determination of habitat condition, as well as inferences about lower trophic levels. Fish populations in most study area streams were surveyed by the Montana Department of Fish, Wildlife and Parks (MDFWP) and the U.S. Forest Service. In addition, extensive fish population data has been collected for Soda Butte Creek within Yellowstone NP by the U.S. Fish and Wildlife Service.

No fish have been captured from Fisher Creek. Following their 1990 survey, the MDFWP concluded that Fisher Creek continues to be affected by acid rock drainages, but that improved potential for fish habitat and populations would likely develop should acid drainages be controlled. Lady of the Lake Creek has moderate to high densities of



Note: Private lands outside of study area not shown



brook trout of various age classes and in fair condition (Aquatic Resources Technical Report - NWP).

The upper Clarks Fork River contains low densities of brook trout, with several age classes represented. Rainbow trout are also present. Brook trout condition factors were low. Farther downstream near the sawmill, trout densities increase two-fold over the upstream site, with several age classes represented. Just prior to the Broadwater River, another two-fold increase in brook trout density was observed over the sawmill section (a three fold increase over the uppermost site). Trout condition improved substantially over the uppermost site. The longitudinal increase in trout density along with improved condition indicates improvement in biological productivity from the Clarks Fork origin to its confluence with the Broadwater River. No fisheries data is available for the Broadwater River.

In the Clarks Fork above Pilot Creek low densities of predominately rainbow trout were found. Low trout densities were probably due to limited habitat availability, since trout condition was good.

Soda Butte Drainage

Algae. The periphyton communities of Miller Creek showed moderate impairment (Aquatic Resources Technical Report - NWP). This is attributed to heavy metals, which have been shown to occasionally exceed water quality criteria and/or physical habitat limitations (i.e., scouring flows, low temperatures, limited nutrients).

Upper Soda Butte Creek (above the McLaren tailings) showed only minor overall impairment, with values for some metrics indicating a relatively healthy periphyton community. Indices for lower Soda Butte Creek (downstream of the McLaren tailings) suggested higher levels of nutrients and siltation compared with upstream sites.

No periphyton data is available for Woody, Republic or Sheep creeks.

Invertebrates. Metric scores for Miller Creek, including Heptageniidae abundance, and the number EPT taxa, indicate that Miller Creek invertebrate communities are composed largely of sensitive species, even though water quality criteria are sometimes exceeded (Aquatic Resources Technical Report - NWP). Unpublished data by Nimmo et al. show that species richness and EPT indices for lower Miller Creek are more similar to study sites on Soda Butte Creek immediately below the McLaren tailings.

Aquatic invertebrate communities in upper Soda Butte Creek are abundant and composed of sensitive taxa, as shown by high Heptageniidae abundance and a high num-

ber of EPT taxa. Immediately downstream from the McLaren tailings all index values are reduced. While these metrics are reduced, the invertebrate community is still comprised largely of sensitive species. Over half the total number of taxa are EPT taxa, and other metric values are comparable to upstream sites. Farther downstream near the Park boundary, total abundance and Heptageniidae abundance increase dramatically, and EPT taxa also increase. Increased total abundance at stations downstream from Cooke City may be the result of increased nutrients, which was also evident in algae samples.

Despite community values similar to upstream sites, benthic invertebrates collected near the McLaren tailings and at sites downstream from historical mine tailings in the Woody Creek drainage have been shown to have elevated whole-body metal concentrations.

No quantitative invertebrate data exists for Woody, Republic, or Sheep creeks. However, a visual survey of Sheep Creek showed a diverse and abundant macroinvertebrate community (Shuler personal observation).

Fish. Miller Creek is naturally void of fish due to high gradients in the lower section. No fish have been collected in this stream. Fish also are not abundant in upper Soda Butte Creek (above the McLaren tailings). A population survey in 1994 in the upper reach yielded low densities of brook and cutthroat trout in fair condition (Aquatic Resources Technical Report - NWP). Below the tailings downstream to Woody Creek, a recent survey yielded 64 cutthroat trout with at least four age classes represented. Moderate densities of cutthroat trout were found below Woody Creek, but few age-1 fish were sampled suggesting poor recruitment.

The primary factor limiting trout production adjacent to and immediately below the McLaren tailings is toxic concentrations of heavy metals. Channel instability, sedimentation, and lack of pools also contribute to a repressed trout population above the Park boundary.

Population surveys at the northeast entrance to the Park indicate that, in general, these sections maintain relatively healthy populations of cutthroat trout but are limited by channel instability and sedimentation. Metal contaminants from the McLaren tailings and other historical mine discharges in the drainage may also be adversely affecting fish populations. Although, population data suggests that some recovery has occurred since the last McLaren tailings reclamation effort.

Fish population surveys of Woody and Republic creeks yielded no fish. Poor habitat conditions, sedimentation, channel instability, and extreme flash flood events likely

prevent fish from inhabiting those streams. Low densities of cutthroat trout are present in the lower reach of Sheep Creek (below the highway), but fish are absent from the upper reach.

Stillwater Drainage

Algae. Periphyton in Daisy Creek indicated moderate impairment probably due to heavy metal physical habitat limitations. One location on the Stillwater River upstream from the Daisy Creek confluence indicated only minor overall impairment. A more recent study showed moderate impairment downstream from Daisy Creek, with recovery not evident until downstream from Goose Creek (Aquatic Resources Technical Report - NWP).

Invertebrates. Sampling of Daisy Creek shows that metric scores are very low (no Heptageniidae and only 2 EPT taxa), indicating Daisy Creek invertebrate populations are under severe stress. Data from the upper Stillwater River indicate that invertebrate communities upstream from the Daisy Creek inflow are relatively abundant, diverse, and composed of sensitive taxa (Aquatic Technical Report - NWP). Downstream from Daisy Creek, Heptageniidae abundance and the number of EPT taxa (as well as other metrics) decline substantially. Only limited recovery is evident when evaluating metric scores for sites farther downstream. The communities in Goose Creek appear abundant and diverse with a high number of EPT taxa and abundant Heptageniidae mayflies.

Fish. Several reaches of the Stillwater River above the wilderness boundary have been electrofished with negative results, confirming that this section is naturally void of fish. Two 500-foot sections, one above and one below the Goose Creek confluence, were electrofished. Habitat conditions for these two reaches is nearly identical, yet significant differences in trout density were found. Above the confluence, only six fish were found in fair to poor condition. Below the confluence 37 fish were found (29 brook trout and 8 cutthroat trout) in fair to good condition. No fish population data have been collected for the Stillwater River below the Goose Creek confluence for about 15 miles.

Threatened, Endangered and Sensitive Species

There are no Threatened or Endangered fish species present within the project area. Recent studies reveal that "genetically pure" Yellowstone cutthroat trout inhabit Soda Butte Creek above Ice Box Canyon a short distance downstream of the Park boundary and in the Stillwater River near Goose Creek (Aquatic Technical Report - NWP). Below Ice Box

Canyon, electrophoretic analysis indicated that cutthroat trout are introgressed with rainbow trout. Pure Yellowstone cutthroat trout are listed as a "Sensitive Species" by the Forest Service due to low population numbers, limited distribution, and recent declines across their former range. Genetic analysis of cutthroat trout from Soda Butte Creek above the barriers in Ice Box Canyon also revealed the presence of a relatively new intrusion of non-native Westslope cutthroat trout. Intense field surveys during 1994 were unable to locate a possible tributary source for the Westslope strain. For the purposes of this analysis, the lead agencies assumed Yellowstone cutthroat populations upstream from the barriers are genetically pure.

Recent genetic analysis of cutthroat trout from the mouth of Goose Creek, near its confluence with the Stillwater River, identified eight genetically pure and two hybrid Yellowstone cutthroat. Analytical uncertainty indicated that the two hybrids may, in fact, be pure. Analysis of additional fish from the Stillwater River is necessary to resolve the uncertainty. For the purposes of this analysis, the lead agencies assumed the Stillwater River Yellowstone cutthroat population is genetically pure.

The Wyoming Game and Fish Department does not believe that genetically pure Yellowstone cutthroat trout inhabit the Clarks Fork River. However, no genetic testing has been done.

Environmental Effects

The following analysis describes anticipated direct, indirect and cumulative effects to fish and other aquatic life and the habitat those populations are dependent upon. Effects are described for each alternative in the three primary areas of concern -

- changes in streamflow
- changes in sediment concentrations; and
- changes in water quality

Where possible, these analyses rely on effects analyses written for the New World Project. It is assumed that the effects of a new underground mine, if developed, would be similar in terms of the relative magnitude and direction of change. Thus, ranges of potential effects developed for the NWP are used as a relative basis for projecting effects of a new mine in the study area.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under Scenario A-1, all 22,000 acres of federal land in the study area remains open to mineral entry, and up to 4,160 acres of private land is available for mineral development. The Forecast for Mineral Activity for Scenario A-1 (Table 3-2), assumes the New World mine would be developed. In addition, there is a 10% probability of a surface mine and a 2% probability of another underground mine. Up to 10 mineral exploration operations may occur. The area of most likely mineral development is shown on Map 2-1.

The effects analysis assumes that the New World mine would be developed. Development of one additional underground mine and one open pit mine is more speculative. As such, the aquatic effects described under this alternative are based on anticipated effects from development of the New World Project (see Aquatic Resources Technical Report - NWP). If additional mines are developed, the effects would be in addition to those described for the NWP, depending upon the location and size of any future mine.

Streamflow Changes

Mining could lead to reductions instreamflows due to ground-water interception or water diversion. Using the proposed New World mine, as an example, streamflow reductions during a 100 year low flow event (a worse case scenario) to area streams ranged between 4-31% depending on specific alternative and stream (see Surface Water Chapter, NWP PDEIS). Percent flow reductions would be much less during normal water years. Percent flow reductions would also be less for higher order streams (i.e., the Broadwater River, the main Clarks Fork River, and lower Soda Butte Creek) because of the higher flow volumes inherent to larger streams.

Effects to Fish: As discussed previously, fish are historically absent from Miller Creek, upper Sheep Creek and the upper Stillwater River due to natural fish migration barriers. Fish are also absent from Woody and Republic creeks due to naturally occurring severe habitat limitations. Thus, flow reductions would potentially affect only aquatic insects in those streams.

Hackman and Raleigh (1982) and Raleigh (1982) characterized habitat suitability for both cutthroat and brook trout during low streamflow as a function of the mean annual base flow (MABF) percent of mean annual flow (MAF). Habitat suitability is optimal when the percentage value is 50 or higher, but decreases proportionately when the percentage is less than 50. Likewise, Tennant (1976) devel-

oped a method for assessing relative habitat health for trout during low streamflow periods based on the same MABF/MAF percentage calculation. According to Tennant (1976), habitat health varies from optimum, when the percent value is >60, to severely degraded when the percent value is <10. These theoretical relationships provide a relative index of habitat change that is useful for comparing minimum streamflow reductions for each alternative. The key ecological relationship evaluated is the relationship between excessively low flows and the amount and quality of pools and instream cover for trout.

Cumulative habitat losses due to streamflow reductions for all mines during a 100 year drought event are estimated to range between 4-31%. Habitat reductions would be less during normal water years. Habitat suitability and availability would increase as streamflow increased during spring and summer months. Thus, habitat reductions would only occur during the baseflow periods, and would subside as flow increased. The highest percent reductions, and thus potential for adverse affects, would occur in smaller headwater streams. This is because existing MABF/MAF percentages, and thus low flow habitat suitability, are already low (i.e., 1.6-6.7%; Aquatic Technical Report, NWP PDEIS). Streamflow reductions would have less effect on fish habitat in higher order streams because habitat availability is generally higher during low flow periods (e.g., 20% for the Clarks Fork River; Aquatic Technical Report NWP). As such, flow reductions would have the greatest potential adverse effects in Fisher Creek, the upper Clarks Fork River, and headwater reaches of Soda Butte Creek. These headwater reaches currently support a fishery, or have potential to support a fishery (i.e., Fisher Creek).

Flow reductions in Fisher Creek could further limit the streams potential to support a recolonizing fish population, especially in lower gradient reaches. Fisher Creek is currently void of fish due to poor water quality. Pools throughout the lower gradient reaches are generally shallow, low quality pools with potential to provide only marginal habitat for trout. Flow reductions would also reduce pool habitat quality and suitability in the Clarks Fork River above the Broadwater River confluence because residual pool volume is currently reduced due to excessive fine sediment accumulations. Habitat changes due to flow modifications in the Broadwater and lower Clarks Fork rivers would be minimal.

If the predicted worse case (4-31%) flow and habitat reductions were temporary and occur once every 100 years, minimal impacts to fish populations are expected. If flow reductions of that magnitude were more frequent (e.g., occurred annually), then annual habitat losses could result in continual fish population declines.

For Soda Butte Creek above the Miller Creek confluence, minimum low flow reductions could reduce residual pool volume and habitat availability. Below the Miller Creek confluence to Woody Creek, poor water quality would still be the primary factor limiting fish. In Soda Butte Creek above the Park boundary, flow reductions would likely have minimal effect on habitat quality because the MABF/MAF percentage is relatively high compared to other smaller order streams in the area. At the Park boundary, mining companies would be required to replace any flow losses so habitat reductions during low flows would not occur.

Effects to Aquatic Insects: Streamflow effects on aquatic insects were evaluated in terms of their potential to be affected by flow changes. This included a review of the scientific literature for the effects of increasing and decreasing flows on aquatic insects.

Predicted streamflow reductions would be unlikely to cause long term effects on aquatic invertebrate and algae populations in any stream in the study area. Habitat constriction in 100-year low flow conditions might occur, but sufficient flow would remain and continue to support aquatic life. Aquatic invertebrate populations are robust even under minimal flow conditions (Hynes, 1970) and would be expected to quickly recolonize stream margins that may be temporarily dewatered during a 100 yr. drought. Aquatic insects have been shown to be able to recolonize disturbed stream reaches rapidly from tributary sources, upstream unaffected reaches, or deeper alluvial areas of the channel.

Sediment Changes

Construction of the New World mine could result in sediment increases. If additional mineral development occurs, the cumulative or additive nature of sediment increases would depend on the timing of development and the effectiveness of reclamation and revegetation efforts of each mine. For the New World Mine, estimated sediment yield increases are 31-140% over natural levels (or 31-61% over existing levels), depending on stream and specific alternative. If an additional underground mine is developed, sediment yield increases are assumed to be within the same relative magnitude as the New World mine. If a new open pit mine is developed, additional sediment yield increases would occur. The greatest increase in sediment would occur during initial construction periods for each mine when soils in disturbed areas would be loosely packed, unvegetated and very erosive. After construction, sediment would decline as soils compact and areas become vegetated. The recovery period would depend on elevation, soil characteristics and effectiveness of BMP's. Assuming some recovery occurs between mine development, projected sediment yield increases for each mine would not be additive, but residual sediment increases would be cumulative.

Effects to Fish: Two specific effects of sediment on trout habitat have been recognized:

- filling interstitial spaces in spawning gravel by depositing fine sediment, thus reducing or preventing further flow of water through the gravel and reducing the supply of oxygen to the embryos or sac fry; and
- entrapment of emerging fry if an armor of consolidated sediment is deposited on the surface of the gravel.

Increasing proportions of fine sediment in substrates have been associated with reduced intra-gravel survival of embryonic brook trout (Hausle and Coble, 1976), rainbow trout (Witzel and MacCrimmin, 1981; Irving and Bjornn, 1984), and cutthroat trout (Irving and Bjornn, 1984), which are fish species known to inhabit the Clarks Fork River, Soda Butte Creek, and the Stillwater River. Increases in fine sediment also can directly limit survival-to-emergence by entrapping emerging fry (Koski, 1975). However, a potentially greater influence on survival by increased sediment deposition is the decrease in dissolved oxygen concentration coupled with reduced intra-gravel water flow (Chapman, 1988; Sowden and Power, 1985).

Because fish are absent from Miller Creek, upper Sheep Creek, the upper Stillwater River, and Woody and Republic creeks, sediment effects would be limited to aquatic insects in those streams.

Using methods described by Stowell et. al. (1983), a relationship between percent sediment yield over natural and fine sediment accumulation in spawning gravels was established for streams within the Gallatin NF (see Aquatic Technical Report for NWP). Estimated sediment yield increases during the initial construction period could result in additional fine sediment accumulations in spawning gravels of 7-24% over existing levels. Sediment yield and subsequent instream accumulations would decline as disturbed areas become revegetated.

The existing sediment concentrations in spawning gravels of area streams are 19.6% for Fisher Creek, 27.8% for the Clarks Fork River, and 25.3% for lower Soda Butte Creek (Aquatic Resource Technical Report, NWP).

Based on studies that evaluated sediment effects on trout embryo survival, high mortality of brook trout embryos can occur when fine sediment concentrations approach 30 percent, and survival of cutthroat and rainbow trout embryos declines sharply above 20 percent fines. Thus, predicted sediment yield increases and subsequent deposition in spawning gravels could adversely affect trout reproductive success in area streams that support a fishery. The

magnitude of effect would be dependent upon existing sediment concentrations, actual increases in sediment, species composition, and site specific channel characteristics that determine the streams potential to flush additional sediment. Higher gradient reaches of streams would accumulate less sediment because of their higher capacity to flush sediment. Lower gradient reaches, like some reaches of Fisher Creek and the upper Clarks Fork River, would likely accumulate more sediment. Sediment increases and subsequent effects on fish reproduction in Soda Butte Creek below the Woody Creek confluence could occur. However, effects would be difficult to measure or attribute to mining because sediment increases would be small relative to existing high sediment loads from Woody Creek.

Effects to Aquatic Insects: Increased sediment loads during initial construction could result in temporary reductions in aquatic biota. Aquatic insects often drift downstream when turbidity increases and deposition of fine sediment in streambeds has been associated with decreases in aquatic invertebrates, often resulting in reductions in sensitive EPT taxa, percent mayfly abundance, and diversity (Aquatic Resources Technical Report, NWP). However, aquatic invertebrate communities of streams generally recover quickly from short-term sediment increases. Spring snow-melt runoff in mountain streams has been shown to remove deposited sediment, allowing benthic invertebrates of streams affected by construction-related sediment increases to recover after construction was completed and areas revegetated (Aquatic Resources Technical Report, NWP). Recovery potential would depend on the effectiveness of sediment control and actual decrease in sediment production. Post construction sediment levels would not be expected to return to pre-mine levels.

The aquatic insect communities currently inhabiting Woody and Republic creeks are expected to reflect the extremely high sediment concentrations and unstable flows that naturally occur in those streams, although no quantitative insect data is available to verify this claim. If this is true, then mine induced sediment increases and associated effects to aquatic insects would likely be difficult to measure in those streams. Likewise, the existing fine sediment concentration in the upper Stillwater River is extremely high (i.e., 51% Aquatic Technical Report, NWP). Therefore, mine induced sediment increases and associated effects to aquatic insects for that reach would likely be difficult to measure.

Water Quality Changes

It is assumed that mine discharge water for a potential future mine would be required to meet discharge permit conditions and limitations, Montana water quality standards, and non-degradation limitations. The Forest Service could not select an alternative for a future mine EIS that would not

meet these standards. Various studies of metal toxicity to aquatic life have been used to estimate potential effects of elevated metal concentrations and form the basis for water quality criteria established by state and federal agencies. Therefore, it is also assumed that discharge permit requirements would protect aquatic life. In order to meet discharge permit requirements, a mine would likely be required to actively treat discharge water. Because water quality in Daisy and Fisher creeks is currently very poor, with effective treatment there is potential to either improve or at least maintain existing water quality conditions in those streams and the streams they flow into. The effects of water quality improvements would depend on the relative change of total metal loads in streams receiving treated discharge water. It is assumed that active treatment would be required during the life of the mine. A more passive treatment plan could be implemented after closure. Furthermore, with the New World mine, other remediation efforts would occur in order to be in compliance with the Clean Water Act. These water quality improvements would improve aquatic health.

However, with any mine, but especially metalliferous mines with a high acid generating potential, there are risks and uncertainties associated with unforeseeable and/or uncontrollable ground or surface water contamination. These risks may include:

- uncertainties associated with ground-water flow and contamination
- uncertainties associated with the effectiveness of mitigation to control ground-water contamination
- effectiveness of water treatment facilities
- risk of impoundment and other facility failures

It is difficult to quantify risk for specific mining proposals, and near impossible to quantify risk for non-specific programmatic proposals such as this. However, some generalities regarding risk can be made for this proposal. The probability of unpredictable contamination is in part directly related to the probability of future mine development, because risks can never be completely mitigated. It is also dependent upon the type of mine (i.e., surface or underground) and scale of operations. For example, it is reasonable to assume that if an alternative reduces the probability of mine development that it would also reduce the probabilities and risk of unpredictable contamination or facility failure. Likewise, the risk of ground-water contamination would be higher for a large scale underground mine than for a small one.

With this Scenario, maximum mineral development is anticipated as all lands remain available for mining. The

New World Project would be developed and additional mines are possible. There would be an increased probability of ground or surface water contamination due to unpredictable or unforeseeable mine facility failures, or ground water becoming acidic. If ground or surface water contamination occurred, then aquatic life could be adversely affected.

Effects to Fish: Many studies have demonstrated that elevated concentrations of copper, cadmium, lead, and zinc may cause a number of toxic injuries to fish and aquatic life (Aquatic Resources Technical Report, NWP). As previously discussed, the existing aquatic insect and fish communities in some streams are currently being adversely impacted by acid rock discharge from historic mining operations. If water quality were improved, especially in Daisy Creek and the upper Stillwater River, or Fisher Creek and the upper Clarks Fork River, then biological health of those streams would also improve. The magnitude of improvements would depend on the magnitude of metal load reductions. If metal loads were reduced, then fish could potentially repopulate lower reaches of Fisher Creek. Bioconcentrations of metals in fish tissues in the upper Clarks Fork River would also be reduced, potentially resulting in increased reproductive success, growth, and survival of fish in that reach. Existing water quality in the Broadwater River does not limit fish production, so assuming water quality did not change, no effects would occur.

Bioconcentrations of metals in fish tissues in Soda Butte Creek would likely remain high because of ongoing metal leaching problems associated with the McLaren tailings and other non-point sources at the mouth of Woody Creek.

If water quality were degraded due to ground or surface water contamination, then biological health could be impaired. The magnitude and duration of biological impairment would depend on the degree of contamination, mode of failure, and effectiveness of clean-up and/or control. Effects to fish and other aquatic life could range from no effect to long term catastrophic effects. If a facility failure occurred, effects would likely persist until clean-up and control. Fish populations would eventually recover and repopulate a stream once conditions improved. However, a catastrophic failure that induced a shock loading beyond which fish could endure, may cause the permanent loss of the Yellowstone cutthroat trout population in Soda Butte Creek above the Park boundary. That population is geographically isolated from other genetically pure populations, so there would be no recruitment source. Geographically isolated populations have a low resilience to catastrophic disturbance. If ground-water contamination occurred, control would be difficult and perhaps not feasible. Depending on the magnitude of contamination, effects to fish could range from no effect to long-term persistent reductions in growth, reproductive success and survival.

Effects to Aquatic Insects: Potential water quality improvements associated with active treatment could also result in higher densities and increased diversity of aquatic insects, especially in Daisy Creek, the upper Stillwater River, Fisher Creek, and the upper Clarks Fork River.

As with fish, effects to aquatic insects from a facility failure or ground-water contamination could also range from no effect to long term persistent effects. Because aquatic insects can recolonize impacted streams after clean-up, the effects of facility failure would not be irreversible. Ground-water contamination could result in decreased abundance and diversity.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under Scenario A-2, 17,820 acres of federal land remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1740 acres of private mineral estate and 4,180 acres of unpatented mining claims (including the Como and McLaren Pits) would not be available for mining. The Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes there is a 2% probability of an underground mine and the potential for up to 5 exploration operations. The area of likely mineral development is shown on Map 2-2.

Streamflow, Sediment, and Water Quality Changes:

Potential for ground-water contamination and mine facility failure and associated risks to aquatic ecosystems would still exist, but at a much lower level than for Scenario A-1, for two reasons. First, under this Scenario the probability and extent of mine development is greatly reduced. Second, because the area of highest mineral and acid generating potential is excluded from mining, potential for ground or surface water contamination would be less. If ground-water contamination or increased sedimentation did occur, then adverse effects to aquatic life could negate any cumulative improvements resulting from reclamation efforts.

The NWM Agreement primarily includes lands within the Fisher and Miller Creek drainages. Other drainages in the study area remain available for mineral entry.

Reclamation plans commensurate with the NWM Agreement (i.e., reclamation of the McLaren and Como pits, closure of the Glengarry Adit), or other remediation of historical mining disturbances via enforcement of the Clean Water Act, would also improve water quality and reduce sediment yield. Water quality is expected to be improved in

Fisher Creek through a potential combination of source water controls and potential treatment of the remaining adit flow from the Glengarry adit.

Effects to Aquatic Life: Because water quality is the primary factor limiting fish and aquatic life in Fisher Creek and the upper Clarks Fork River, water quality improvements via active treatment and reclamation could improve the health of aquatic ecosystems. Passive treatment prescriptions (e.g., rerouting water from sulfide mineral sources, liming of acidic soils, etc.) would improve water quality and have long term, permanent benefits. However, total metal load reductions may be less than actively treating water through a water treatment plant, which would occur if a mine like the New World mine was developed. Active treatment would likely be temporary during the life of the mine, and passive prescriptions would likely be employed after closure.

Adverse affects due to streamflow reductions and increased sediment could be comparable to those described for the NWP

Effects to Yellowstone National Park for Scenarios A-1 and A-2

Soda Butte Creek at the northeast entrance to the Park, below Ice Box Canyon, and near the Lamar River has a relatively healthy population of cutthroat trout. Above Ice Box Canyon, Yellowstone cutthroat trout are genetically pure and below the Canyon they are introgressed with rainbow trout. Factors limiting trout production in Soda Butte Creek in the Park include overall lack of adult habitat, channel instability problems, and sedimentation. Past overfishing and existing elevated metal concentrations from the McLaren tailings and other metal sources at the mouth of Woody Creek may also limit trout populations in the Park. Trout density has increased since the last McLaren tailings reclamation effort in the early 1990's.

If a new mine (or mines) were developed, no losses in streamflow at the Park boundary would be allowed. Therefore, no streamflow affects to aquatic life would occur.

If sediment increased in Miller Creek or upper Soda Butte Creek due to mine construction, there would be some potential to adversely affect aquatic life in lower Soda Butte Creek in the Park. However, given the extremely high natural sediment loads entering Soda Butte Creek from Woody and Republic Creeks, it would be difficult to attribute any adverse affects to mine development. Sediment increases from mine development would be a very small percentage (e.g., <1%) of the total sediment yield in Soda Butte Creek. There is concern (comments received by

Yellowstone NP) that sediment generated from a mine area could be toxic (e.g., metal laden) and therefore more detrimental to aquatic organisms than the natural sediments introduced throughout the basin.

Existing water quality problems in Soda Butte Creek are primarily the result of metals leaching from the McLaren tailings and other sources near Woody Creek. No additional reclamation is known to be planned for those areas with or without the NWM Agreement. Therefore, no decrease in metal loads would occur. However, if a new mine (or mines) were developed, the potential for ground and/or surface water contamination in Miller Creek (or Sheep Creek) would increase, thereby increasing the potential for adverse effects to aquatic life in Soda Butte Creek. If a catastrophic failure occurred, including extreme, uncontrollable ground or surface water contamination, then the genetically pure population of Yellowstone cutthroat trout above Ice-Box Canyon could be permanently lost.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under Scenario B-1, 17,760 acres of federal lands are immediately subject to the mineral withdrawal. However, 4,160 acres of private land and 4,240 acres of existing unpatented mining claims remain available for mineral development (Map 2-3). The Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes the New World Mine would be developed. In addition, there is a 10% probability of a surface mine and a 2% probability of another underground mine. Up to 10 mineral exploration operations may occur. The area of likely mineral development is depicted on Map 2-3.

Streamflow, Sediment and Water Quality Changes:

As no mineral exploration or development could occur on 17,760 acres withdrawn, there would be a reduced risk of adverse effects from mining to streamflow, water quality, fish, and aquatic life. While some of the withdrawn land has high mineral potential, the withdrawal does not have an immediate effect on the highest potential mineral area near Fisher and Henderson Mountain. If the NWM Agreement is not implemented, then the amount and probability of future development is the same as described for Scenario A-1. Streamflow reductions, sediment increases and water quality changes associated with mining on private and unpatented mining claims, including the NWP, are described under Scenario A-1. Lands that are available for mining are concentrated in the Fisher Creek and Miller Creek drainages. The mineral withdrawal reduces the like-

likelihood of mining in the Woody, Republic, Sheep Creek, and portions of the Stillwater River.

Effects on Aquatic Life: The direct, indirect and cumulative effects of future mining on private and unpatented mining claims in this area, including the New World mine, are described under Scenario A-1.

This scenario would reduce the availability of adjacent federal land for NWP facility sites, and require facility development on private land and on existing, unpatented mining claims. This could result in more environmentally impactful locations for some of the NWP facilities, and increase the risk to water quality and aquatic habitat compared to Scenario A-1.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented.

Under this scenario, 17,760 acres of unclaimed federal land are immediately subject to them mineral withdrawal. Interests acquired under the NWM Agreement including up to 1740 acres of private mineral estate and 4,180 acres of unpatented mining claims (including the Como and McLaren Pits) would be withdrawn when the NWM Agreement is implemented. 60 acres of unpatented mining claims and 2,420 acres of private land remain available for mineral development (Map 2-4). The Forecast for Mineral Activity, which was developed as one possible Scenario for analysis purposes (Table 3-2), assumes no mines would be developed and 1 exploration operation is possible. Private land open to mineral development is depicted on Map 2-4.

Because no mines are anticipated, no mining related impacts (i.e., streamflow reductions, sediment increases, water quality degradation) would occur. Thus, no adverse affects to aquatic habitat or life would be expected. Some sediment increases could be caused by exploration activities on private land. Because water treatment facilities associated with mine development would not be constructed, there would be less potential for active treatment of Glengarry Adit and other point or non-point sources of acidic water. This assumes that a potential future mine would construct a water treatment facility.

Without mine development, risks of ground or surface water contamination due to failure of various structural facilities (e.g., tailings impoundments) and unpredictable or uncontrollable ground-water contamination would be eliminated.

Until planned reclamation occurs, the existing condition of aquatic communities would not change for area streams. Poor water quality would continue to be the primary factor

limiting aquatic life in Daisy Creek, the upper Stillwater River, Fisher Creek, and Soda Butte Creek from the tailings downstream to the Woody Creek confluence. Bioaccumulated metals in fish residing in the upper Clarks Fork River and in lower Soda Butte Creek would continue to exert some limiting influence on growth, survival and reproductive success.

As previously discussed, planned reclamation commensurate with the NWM Agreement will further improve watershed health (e.g., reduce sediment yield and improve water quality), but to an unknown extent. Water quality improvements will subsequently improve the biological health of area streams to the extent reclamation efforts are successful. Water quality is expected to be substantially improved in Fisher Creek through a potential combination of source water controls and potential treatment of remaining adit flows. Because water quality is the primary factor limiting fish and aquatic life in Fisher Creek and the upper Clarks Fork River, water quality improvements would greatly offset any habitat constriction that may occur due to reduced streamflow. Improved water quality would eventually result in increased aquatic insect and algal diversity and biomass in Fisher Creek, the upper Clarks Fork River, Daisy Creek, and the upper Stillwater River. Depending on the effectiveness of reclamation, insect and algae communities could be more comparable to those found in nearby relatively unaffected streams, like Lady of the Lake Creek. Aquatic insect communities in the Broadwater River, and Sheep Creek would likely be unchanged because reclamation is not planned in those watersheds.

Water quality in Soda Butte Creek below the McLaren tailings would remain poor because the McLaren tailings is not part of current reclamation plans. Likewise, no reclamation is proposed for mine disturbances in Woody or Republic creeks, so water quality in those streams would not change. Nor would water quality change in the Broadwater River or Sheep Creek.

With reclamation, sediment levels would drop in streams currently affected by unnaturally high sediment discharges. For streams that either currently support or that could support a fishery, habitat quality for adult and juvenile fish would improve as sediment is flushed and channels adjust to lower sediment discharges. Pool depth and residual pool volume would increase. These habitat improvements would be most consequential in lower Fisher Creek and the upper Clarks Fork River where high sediment levels have decreased habitat quality. Fish reproductive success would also improve as sediment is flushed from spawning gravels.

Spawning habitat improvements could be realized in upstream and downstream reaches of the Clarks Fork and Stillwater rivers. Likewise, habitat quality for aquatic in-

sects would improve. Aquatic insect diversity and abundance would increase in streams where sediment deposition or poor water quality is currently repressing insect populations, especially the upper Stillwater River, Fisher Creek, and the upper Clarks Fork River. Aquatic insect communities in Woody and Republic Creeks would be less likely to change because those streams have naturally high sediment levels. Only minor, if any, changes in habitat quality are expected for Soda Butte Creek below the Woody Creek confluence because of the naturally occurring high sediment loads from the Woody and Republic creek watersheds.

Eliminating the potential for future mine development eliminates risks associated with potential mine facility failures (i.e., tailings impoundment failures) and potential ground-water contamination. This, in turn, eliminates risks for adverse effects to aquatic life which could offset any cumulative improvements resulting from planned reclamation.

Effects to Yellowstone National Park

If federal lands within the proposed withdrawal area are closed to future mineral entry, and if the NWM Agreement is implemented, then there would be no potential for adverse effects to aquatic life in Soda Butte Creek within Yellowstone NP due to new mine development. Risks associated with ground or surface water contamination would be eliminated. The existing conditions of aquatic habitat and biota would remain, unless reclamation of point and non-point sources of metal pollution occurred within the Miller or Woody and Republic Creek watersheds, or the McLaren tailings.

If a new mine (or mines) were developed under the No Agreement Scenario, then potential effects to Yellowstone NP aquatic resources are similar to those described for Scenario A-1.

Cumulative Effects Common to All Scenarios: Past, present and reasonably foreseeable future actions (i.e., highway reconstruction), when considered collectively, significantly affect aquatic resources. Historical watershed disturbances, including roads, and other mining related activities, have increased sediment discharge and have reduced water quality in many study area streams. Fisher Creek, the upper Clarks Fork River, Daisy Creek, the upper Stillwater River, Woody Creek, and upper Soda Butte Creek have been most heavily impacted. These disturbances have adversely affected the health of aquatic communities in those streams. Recent mine reclamation efforts, including recontouring and revegetating roads and open pit mines, and rerouting water from the Glengarry adit have improved watershed

and aquatic health, but to an unknown degree. Future reclamation efforts will continue to improve the overall health of streams within the study area. Future highway reconstruction could induce temporary sediment increases.

Conclusion

If the physical and biological data are considered as a whole, it is possible to make broad conclusions on the condition of the streams in the study area. Fisher Creek is in poor condition (Map 3-3) as a result of metal concentrations and limited habitat. The Clarks Fork River is in only fair condition in the study area. This is a result of metals from Fisher Creek and poor habitat quality in the form of sedimentation and limited pool and spawning sites. The Broadwater River is in good to excellent condition.

Miller Creek is naturally void of fish, and the invertebrate community indicates a relatively healthy stream. For Soda Butte Creek, conditions for fish and aquatic life are fair upstream of the McLaren tailings and downstream from Woody Creek (Map 3-4). Limitations include high gradients and low flows for the upper reach, and limited habitat and high sediment loads downstream from Woody Creek. Poor conditions are present in the section adjacent to and downstream from the McLaren tailings. Poor conditions are present in Woody and Republic creeks primarily due to extremely high sediment loads and unstable habitat conditions. Historic mining may be influencing water quality in those streams. Sheep Creek is in good overall condition, and naturally void of fish.

Daisy Creek and the Stillwater River below the Daisy Creek confluence to Goose Creek are in poor health due to poor water quality and high sediment loads. Upstream of Daisy Creek and below Goose Creek the stream is in fair condition. The Stillwater drainage above the wilderness boundary is naturally void of fish.

For Scenario A-1, the potential for at least one, and possibly three new mines to be developed in the study area remains unchanged. The effects of mining on fish and other aquatic life can generally be grouped into three main areas of concern; 1) reduced streamflow, 2) increased sediment delivery to streams, and 3) changes in water quality. These three factors may produce adverse effects alone, in combination, or synergistically. The magnitude, longevity, and direction of change is dependent in part on the existing condition of aquatic habitat and biota. For example, some streams in the study area (e.g., upper Fisher Creek, Daisy Creek) have been severely impaired by historic mining. For those streams, reducing streamflow, increasing sediment, and reducing water quality would have minimal effect on

aquatic habitat and biota in terms of the relative magnitude and direction of change. They are already severely impaired and the downward trend commensurate with more degradation would be subtle. For streams with comparatively healthy aquatic communities (e.g., Miller Creek, the Broadwater and Clarks Fork rivers, and Soda Butte Creek), degradation could be more significant. Conversely, with improved water quality via active treatment or reclamation, the direction and magnitude of change for impaired streams could be positive and profound.

With any mine, but especially underground metalliferous mines with high acid generating potential, there are risks and uncertainties associated with unforeseeable and/or uncontrollable ground or surface water contamination. Sound facility design and mitigation can reduce, but not eliminate these risks. For healthy stream environments, especially those with high recreational value (i.e., Wild and Scenic designated reaches of the Clarks Fork River and Soda Butte Creek through Yellowstone National Park), the element of risk acceptability is of higher concern. Maintaining the current minerals management allows for the potential of mine development and therefore the potential for ground or surface water contamination. This in turn, increases the risk of adversely affecting the health of aquatic systems in the study area compared to the alternative of prohibiting the potential for minerals exploration and development.

For Scenarios B-1 and B-2, there is potential to eliminate mining development in the study area if the NWM Agreement is implemented, thereby eliminating the potential for adverse effects to aquatic habitat and biota related to mine development. With planned reclamation and remediation, the health of Fisher Creek, the upper Clarks Fork River, Daisy Creek, and the upper Stillwater River would be significantly improved. There would be no risks associated with unpredictable ground-water contamination.

If the NWM Agreement is not implemented, there is still potential for one underground mine, in addition to the New World mine, and one open pit mine to be developed under existing valid claims. Reduced streamflow, and increased sediment would adversely affect aquatic habitat and biota. Water quality would likely improve over existing conditions because of discharge permit limitations and State Water Quality Laws. These improvements would have beneficial effects to fish and other aquatic life. However, the potential risks associated with ground and surface water contamination due to unforeseeable or uncontrollable events, would remain.

RECREATION, SCENIC, AND SPECIAL AREAS INCLUDING YELLOWSTONE NATIONAL PARK

Introduction

This section addresses the issues listed and described in Table 3-3. The introduction also includes a description of the importance of recreation and tourism in this area, and a summary of recreation trends.

Importance of Recreation and Tourism in the Greater Yellowstone Area

The quality of outdoor recreation experiences currently offered in the Greater Yellowstone area is extremely high. This can be attributed to the synergy of the spectacular scenery, abundant wildlife, and unique geologic features, all within a vast area, much of which is still relatively undisturbed by human development activities.

Maintenance of recreational resources in the area is important for both economic and quality of life reasons. The region's growth is being driven primarily through growth in spending on recreation and tourism products and services. If recreational resources were to become degraded or made more difficult to access, the health of the economy might be threatened.

Indirect effects of change in the area's character are at two levels. From a national and international perspective, change in the area's amenity resources could reduce its recognized value as a relatively natural or preserved ecosystem and as an important region for high quality outdoor recreation. At the local level, the vast majority of the 300,000 residents living in and around the area are linked to these natural amenities through economic, recreational, lifestyle, and social means.

Some persons value this recreational/tourism economy when contrasted with an economy based on more traditional basic economic sectors such as manufacturing or mining, which are perceived by some to be in conflict with the quality of life in the area. Furthermore, since many residents of the area are users of the local and regional recreational resources themselves, degradation of, or reduced access to these resources would adversely affect some local residents' quality of life.

A Wilderness Society report (1992) stresses the importance of recreation, tourism, and non-labor income in the area's

TABLE 3-3. ISSUES RELATING TO RECREATION, SCENIC VALUES, AND SPECIAL AREAS INCLUDING YELLOWSTONE NATIONAL PARK

ISSUE	MEASUREMENT INDICATOR	UNIT of MEASURE
Effect on recreation opportunity and experience	Changes in recreation settings, visitation, and experiences.	Recreation opportunity settings, visitation
Scenic integrity	Alterations to landscape, compliance with visual objectives	Acres disturbed, qualitative
Effect on Yellowstone National Park	Recreation experiences, visitation, changes to Park operations, air and water quality.	Qualitative, noise, traffic, recreation experiences, visitation.
Effect on designated wilderness	Effect on wilderness attributes-solitude, natural integrity, primitive recreation, and apparent naturalness	Qualitative, noise, lighting, increase in visitation, water quality.
Effect on roadless areas	Effect on roadless area suitability and attributes	Qualitative, solitude, manageability and boundaries, natural integrity, primitive recreation opportunities.
Effect on wild and scenic river suitability	Characteristics of wild and scenic rivers, outstandingly remarkable values	Qualitative, water quality, scenery, free-flowing, recreation.
Effect on air quality	Emissions and particulates	

economy. The report presents an analysis of economic data and concludes that the health of the economy in the region is directly connected to the health of the ecosystem. The economy within the region is supported by:

- world-class quality of recreational resources;
- scenic amenities provided by Yellowstone NP and the surrounding National Forests and wildernesses; and
- overall high quality of life that attracts both tourists and new residents.

The overall quality of life, rather than strictly economic reasons, attracts people to the area. The Wilderness Society analysis is supported by Corkran (1993), who conducted two separate surveys of Cooke City/Silver Gate residents and business owners. Survey responses showed that the economic base of the current community and economy is the quality of the natural and social environment. The residents and entrepreneurs have assembled a modest, but sufficiently rewarding, economy and community.

Because of the current use patterns and potential for increasing demand for high quality recreational resources, continued access to and protection of regional and local resources (near the study area) is an important goal of many persons and governmental agencies. However, the persis-

tent growth in national and regional populations would continue to cause degradation of the recreation experience. Examples include localized overcrowding and heavy tourist traffic in summer, air and noise pollution from snowmobiles in winter, and impacts to scenery viewing from increasing residential development on private land in valleys throughout the area. Evidence of the concern is illustrated by the numerous studies and planning efforts which have been underway or recently initiated to begin addressing these problems. A few examples include: a recently completed transportation study in Yellowstone NP; a cooperative National Park-National Forest winter use plan; Yellowstone NP's Backcountry Management Plan; and ongoing "Limits-of-Acceptable-Change" (LAC) analysis in National Forest wildernesses.

Recreation Trends

Based on recent trends, the demand for the type of recreation offered by this area is anticipated to grow. Evidence of this trend is provided by the 1994-95 National Survey on Recreation and the Environment, the latest in a series of National Recreation Surveys conducted by the federal government. Approximately 17,000 individuals were surveyed. The percent change of persons participating in

outdoor recreation by activity, comparing 1982—83 survey data with 1994-95 survey estimates, is displayed in Table 3-4.

For the Bozeman/Gallatin National Forest area, studies completed by A and A Research (NWP PDEIS, Recreation Technical Rpt., 1996) indicate that more regional residents in general participate in all types of outdoor recreation and in a wider variety of outdoor recreation than the national norm. Highest uses still fall in the driving for pleasure category and in trail related recreation activities. A much higher percentage of regional users engage in winter sports, hunting, and backcountry types of recreation than the national norm.

TABLE 3-4. OUTDOOR RECREATION PARTICIPATION TRENDS

ACTIVITY	% CHANGE (1982 - 1995)
Birdwatching	+ 155%
Hiking	+ 93%
Backpacking	+ 73%
Camping-primitive	+ 58%
Off-road Driving	+ 44%
Sightseeing	+ 39%
Snowmobiling	+ 34%
Camping-developed	+ 38%
Cross Country Skiing	+ 23%
Picnicking	+ 16%
Fishing	- 4%
Hunting	- 12%

Affected Environment

Recreation Activities in Study Area

Wildland recreation activities in the study area are diverse and occur year-round. Table 3-5 summarizes key attractions and recreation opportunities. Refer to Map 3-5 for the location of key recreation features within the study area. The NWP PDEIS Recreational Technical Report is the primary source for information about recreation uses within the study area.

Backpacking and Backcountry Use. Four trails receive the bulk of the recreational use in the study area. These are the Clarks Fork trail (USFS #567), the Lady of the Lake trail (USFS trail #31), Goose Lake Road and trail (USFS Rd. 3230 and trail #25), and the Lake Abundance Road and trail (USFS Rd. #212 and trail #84). The Clarks Fork trailhead received approximately 7,000 recreation visits in 1995. The Lady of the Lake trail is the second most heavily used trail in the study area. The Goose Lake jeep trail ranked third, and the Lake Abundance jeep and foot trail ranked fourth for amount of use received. Access to both the Lady of the Lake trailhead and the Goose Lake jeep trail is by the Lulu Pass Road. The Daisy Pass Road is used to access Lake Abundance, and U.S. 212 provides access to the Clarks Fork trailheads. Peak use of area trails occurs during July and August.

Fishing. There are three general locations within and adjacent to the study area where most of the fishing activity occurs. These include the lakes and streams in the Clarks Fork trail area (Kersey, Fox, and Rock Island lakes), the "upper" lakes area accessed by the Lady of the Lake and Goose Lake Roads (Goose Lake, Lady of the Lake, Round Lake, and Aero Lakes), and the Lake Abundance and the lower Stillwater River areas, which are accessed by the Lake Abundance jeep trail. The main season of use is late June to mid-September, depending on ice and snow conditions. The average annual number of angler days for the three fishing areas are: Clarks Fork (3,318), Goose Lake/Round Lake area (514) and Lake Abundance area (434) (NWP PDEIS, Recreation Technical Report).

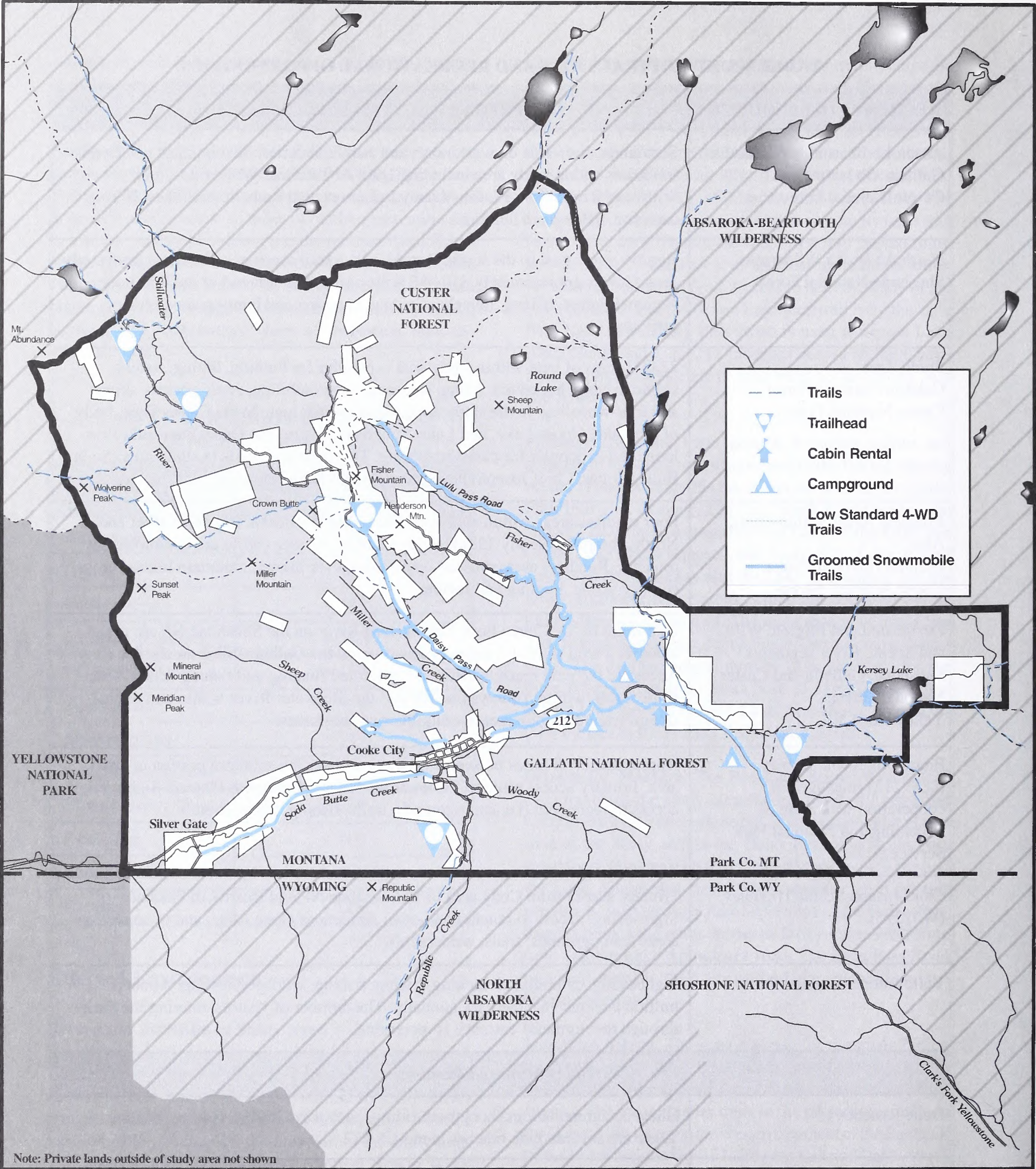
Driving for Pleasure. The Beartooth Scenic Byway (US 212) traverses the study area linking the Red Lodge and Cody areas with Yellowstone NP. The most popular gravel road in the study area is the Daisy Pass Road/Lulu Pass Road loop. Popular jeep trails include the Goose Lake and the Lake Abundance roads. Main season of use for this activity is July through mid-September. The Daisy Pass Road provides the main access to Daisy Pass, Wolverine trail, and the Lake Abundance road. The Lulu Pass Road provides access to the Lady of the Lake trailhead and the Goose Lake road.

Mountain Biking. The season of use for mountain biking generally occurs from late-June to mid-October or until trails become impassable due to snow. Peak use is mid-August. The most popular trails in the project area include the Daisy-Lulu loop and the western segment of the Bannock trail. Others include Goose Lake jeep trail and Lake Abundance road.

Hunting. Hunting for a variety of big game occurs in the study area. Lands surrounding the Daisy-Lulu loop receive heavy hunting pressure, especially around Daisy Pass where,

TABLE 3-5. KEY ATTRACTIONS AND RECREATIONAL OPPORTUNITIES

RECREATION RESOURCE	PRIMARY ACTIVITIES/COMMENTS
Absaroka-Beartooth Wilderness Gallatin, Shoshone and Custer National Forests	Surrounds study area on west, north and east boundaries. Seven major wilderness trailheads within study area including Lake Abundance, Wolverine Creek, Stillwater River, Goose Lake, Kersey Lake area, and Lady of the Lakes. Hiking, camping, fishing and hunting.
North Absaroka Wilderness Shoshone National Forest	Borders study area to the south. Republic Pass trail accesses wilderness from study area. Covers approximately 350,488 acres at the northern end of the Shoshone National Forest. Hiking, horseback riding, camping and hunting are popular activities.
Study Area Gallatin National Forest Custer National Forest	22,000 acres of land within study area is popular for hunting, hiking, fishing, scenic driving, horseback riding, camping, snowmobiling, cross-country skiing and four-wheeling. In the study area, popular trails include the Clarks Fork, Lady of the Lake, Goose Lake, and Lake Abundance trails. The Daisy Pass/Lulu Pass loop road is popular for pleasure driving. Three campgrounds in study area (Soda Butte, Colter, Chief Joseph) have about 9,000 visitors annually.
Roadless Areas within Study Area Gallatin National Forest, Custer National Forest	Four roadless areas within study area including Beartooth, Republic, Reef and North Absaroka. Nearly 12,000 acres of the study area (60%) are inventoried as roadless. Roadless areas provide opportunities for hiking, mountain biking, cross country skiing, hunting and fishing.
Designated and Eligible Wild and Scenic River segments. Shoshone, Gallatin and Custer National Forests, Yellowstone NP	20.5 miles of the Clarks Fork Yellowstone River on the Shoshone NF are designated as a wild river. 1.5 miles of this river on the Gallatin NF is an eligible river. Access to the wild reach is difficult but limited floating and fishing occur. Soda Butte Creek within Yellowstone NP and the Stillwater River within and downstream from the study area are eligible river segments.
Beartooth Scenic Byway (U.S. 212) (managed in cooperation with State of Wyoming and National Park Service).	Approximately 8 miles of Scenic Byway traverses the southern portion of study area. Primary access route to Yellowstone NP and Beartooth Plateau. Sightseeing, access to recreation (i.e. campgrounds, trails, fishing, hunting, etc.)
Chief Joseph Scenic Highway (WY 296).	Primary access from Cody area to Yellowstone NP and Beartooth Plateau. Sightseeing, access to ranches and other residences along route, and to recreation areas (campgrounds, trails, wilderness).
Yellowstone National Park	Sightseeing, camping, picnicking, hiking, fishing, wildlife-viewing. About 3 million persons visit the Park annually. The number of visitors entering the Park through the northeast entrance is increasing.
Privately Managed Resources	
Dude Ranches	Guest accommodations, horseback riding, pack trips, hiking, fishing, hunting. There are several dude ranches along US 212.
Outfitting	Several outfitters operate in the vicinity of the study area. Dude ranches along the transportation corridor also provide guide service.



	Yellowstone National Park	Study Area Boundary
	Wilderness	Streams
	Private lands (not subject to withdrawal)	Trails
	National Forest Land	Roads
		National Forest Boundary

MAP 3-5

RECREATION FEATURES

on opening day, 50 to 100 vehicles and horse trailers are parked along the road. Daisy Pass serves as a starting point for outfitters and others using the Wolverine and Lake Abundance Roads to access hunting areas and camps in the Slough Creek and Stillwater River drainages. The Lake Abundance and Goose Lake roads as well as the Clarks Fork trail also receive use by hunters. The Cooke City area is located in one of Montana's few early elk hunting districts. The early season begins September 15 and lasts until the regular season starts at the end of October. The regular elk season lasts until December 1.

Snowmobiling. During the long winter season (mid-November to mid-April), snowmobiling is the primary recreational activity in the study area. Peak periods of use are the Christmas holiday season, and February and March. There are over 21 miles of groomed snowmobile trails in the Cooke City area. Counter data provided by Montana Department of Fish, Wildlife and Parks showed about 37,000 sleds inventoried for the 1995-96 season. Some of the most heavily used trails include U.S. 212, Daisy Pass, Lulu Pass, and the Goose Lake roads. Important off-trail areas include the Lake Abundance Road area, open terrain to the north of Scotch Bonnet and Sheep mountains, and the open areas along Miller and Fisher creeks.

Cross-country Skiing. The general season of use for cross-country skiing is basically the same as the snowmobiling season (from mid-November to mid-April). Peak use periods are Christmas holidays and weekend periods to early April. Spring skiing can last into June, especially in the Beartooth Plateau region. The Republic Pass trail south of Cooke City is one of the most used trails for cross-country skiing. Woody Creek trail, particularly along Woody Ridge, is also a popular ski route. Sheep Creek basin, north of U.S. 212, receives heavy use. There are no groomed snowmobile trails into this area, and skiers ski along Sheep Creek and in the bowl, which is flanked by Miller and Mineral mountains. Cross-country skiing also occurs on the south and east slopes of Henderson Mountain, the northeast slopes of Fisher Mountain, and on the southwest slopes of Scotch Bonnet Mountain.

Campgrounds and Picnic Areas. The Gallatin National Forest manages three campgrounds within the study area: Soda Butte, Colter, and Chief Joseph. The district also maintains the Clarks Fork picnic area and a rental cabin at Kersey Lake. Total use is about 10,500 visitors per year.

Guides and Outfitters. Outfitters must obtain permits from the local Ranger District to operate on National Forest lands. Permits are issued for both day use and overnight camping. Permitted outfitter and guide use for the area has been as follows: overnight use in Cooke City and Beartooth plateau—1,200 service days, Slough Creek—1,326 service

days, and day use in Cooke/Crandall/Sunlight/ Beartooth Plateau—5,850 service days. Season of use is generally July and August for the summer season and mid-September to mid-October for the hunting season. Outfitters will usually use the same trailheads that are popular with other users (Clarks Fork, Lady of the Lake, Goose Lake, Lake Abundance, and Wolverine trails), but often leave the main trail and go cross-country to provide their guests with a more primitive experience and to increase their hunting opportunities. There are other outfitters who do not have camps in the Cooke City area, but may pass through the area en route to their camps. Most of these outfitters drive up the Daisy Pass Road and park their vehicles at Daisy Pass. From there, they use the trails heading west (Wolverine and Lake Abundance) to access their camps on Slough Creek and other drainages further west.

Recreation Opportunity Settings

An inventory of an area's wildland recreational settings based on the physical, social and managerial attributes of the area is the basis for the Recreation Opportunity Spectrum (ROS). Based on combinations of these attributes, all National Forest lands are characterized by recreation opportunity classes. These classes range from primitive, represented by wilderness areas, to rural, represented by highways, developments, and towns. The opportunity classes serve as an inventory tool for current recreation conditions and visitor expectations. As potential mineral development could lead to changes in these settings, they serve as a useful measure to help describe the consequences of such change. (ROS Primer leaflet R-6-021-90, April 1990). The current recreation opportunity settings in the study area are outlined on Map 3-7.

Designated Wilderness. Designated wilderness areas, such as the Absaroka-Beartooth and the North Absaroka, are examples of the primitive wildland recreation opportunity spectrum, where the physical settings are large areas of land, remote from human developments, with little or no evidence of any human activities. These settings offer substantially more opportunity for solitude, risk, and discovery. Socially, encounters with others is low and then only with people engaged in similar activities. Those who engage in these activities have a high probability of experiencing isolation from the sights and sounds of humans, independence, closeness to nature, tranquility, and self-reliance; the environment offers challenge and risk. Presence of land management control is low.

Semi-primitive Wildland Settings. Semi-primitive wildland settings are common in the study area. Republic/Woody Creek, Sheep Creek, Upper Stillwater, Round Lake and Kersey Lake are considered semi-primitive settings. Semi-primitive settings are typically undeveloped and ac-

cessed by trail or low standard four-wheel drive roads. Along or near the forest trails, a recreationist would find landscapes of distinctive scenic quality. The landscape appears unaltered and intact. The only noticeable deviations maybe some past mining activities. Leaving better roads behind, the recreationist finds increasing isolation from the sights and sounds of human activity. The degree of risk and isolation increases and recreation activities become increasingly dependent upon natural surroundings. Hiking, mountain biking, and horseback riding occur on trails while motorized use is generally limited to low standard roads.

Roaded Natural-Appearing Wildland Setting. The roaded natural-appearing wildland setting includes the Lulu Pass/Daisy Pass loop road. Subtle modifications to the landscape may be present including timber harvest and signs of historic mining activity, but the natural appearing landscape still dominates the scene. There is usually less opportunity for solitude due to access provided by roads. Along the roads or near the Miller Creek Road, a recreationist will find landscapes of distinctive scenic quality with sightings of Miller Creek, Miller Mountain, Bull of the Woods Pass, Crown Butte, Fisher and Henderson Mountains. Recreation improvements are limited to roads and trails.

Rural Class. The rural class is represented by the corridor along US Highway 212 including Cooke City and Silver Gate. Rural settings include concentrated human developments with higher levels of human activity.

A sequential progression of settings from the more developed areas along the highway to the more pristine and primitive wildland recreation settings of the wilderness occurs within the study area.

Environmental Effects

Introduction

Assessment of effects on impacts to recreational resources and opportunities is difficult because of the subjective nature of the recreation experience, the complex factors contributing to recreational use and the determination of "acceptable" levels of use. People are attracted to an area because of the recreation setting and opportunities present. In general, if the setting, attractions, and character of the area change, there is a strong likelihood the recreational use of the area will change. Sources of potential effects include changes in settings due to mining facilities, potential loss of solitude due to mining-related noise, lighting and traffic, and increase in local recreation use due to increases in local populations.

Effects to recreation resources cannot be viewed or analyzed in isolation. Rather, the effects are highly interdisciplinary in nature. Recreational resources have relationships with many other elements of the human and natural environments. The best professional judgment of the lead agencies as to the potential effects upon recreation resources is presented in the following discussion.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under this scenario, all 22,000 acres of federal land in the study area remains available for mineral entry, and up to 4,160 acres of private land would be available for mineral development. The Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes the New World Project would be developed. In addition, there is a 10% probability of an additional surface mine, and a 2% probability of an additional underground mine. Up to 10 mineral exploration operations may occur. Area of likely mineral development is shown on Map 2-1.

With no mineral withdrawal, roadless areas and the area immediately adjacent to Yellowstone NP remain open to mineral entry. Development within these areas would change recreation settings and would most likely have an adverse effect on recreation occurring in the vicinity of future mines. Some recreational users of the immediate mine area would be displaced and would use other resources either within or outside the study area. Future mining would not likely decrease overall visitation to National Forests or National Parks in the surrounding area.

The construction, operation or presence of mining-related facilities would affect wildland recreation settings, experiences and visitor use. Mining would:

- remove recreational resources, or modify recreation settings, or change access to a recreation area;
- change recreation experiences due to project-related activities (e.g., mine truck traffic) or presence of a project-related facilities;
- reduce the feelings of solitude and remoteness due to introduction of visual, sound (e.g., noise) or other sensory effects from project-related activities which would conflict with recreational use;
- and potentially degrade the health of the regional ecosystem (e.g., including plants, trees, wildlife, and fish), thereby degrading the opportunity to use these resources for recreation.

Some of these direct effects would be lessened or removed when mining and reclamation is completed. Even after reclamation, some recreational resources near project sites would never return to pre-project quality because of the long-term existence of the tailings disposal area(s) and other mining-related changes to the existing environment.

Conflict with Mining Activities and Facilities. Direct effects to wildland recreational resources and opportunities could result from mining related activities including project construction, operation, and the location of facilities. Some of these effects are sensory in nature (an effect from sight, sound, smell, etc.). Other effects would result from direct conflict with project operational elements in such a way that the existence of or access to an existing recreational resource would be adversely affected or lost by the general public.

Future mining would directly affect recreational use of the lands to be used for project facilities and use of the highways and roads that provide access to the area. For example, if a mine the scale of the New World Project is developed, access roads such as the Lulu Pass Road would be substantially upgraded to serve as the main access route to the mine area. This road is currently part of a network of snowmobile trails, and is generally regarded as an outstanding snowmobiling experience by both local residents and visitors. As this road or the Daisy Pass road could become mine access roads, part of these roads would become unavailable to snowmobilers to avoid conflict with mining facilities and safety concerns. Even though alternate snowmobile routes could be developed, the experience may change.

Currently, US 212 from the junction with Wyoming 296 to Cooke City is not plowed and is a popular snowmobile route during the winter season. If a large scale mine is developed, US 212 would be plowed to provide for year-round access, displacing current snowmobile use. While this snowmobile trail could be rerouted to provide access to Cooke City, it is unlikely that the snowmobiling experience would be similar in quality to current conditions. With these two changes to the local snowmobile recreational resource base, some portion of this recognized recreational user group would be adversely affected, resulting in either a degraded recreational experience and/or in changes in local or regional snowmobiling use patterns.

The Lulu Pass Road and Daisy Pass Road also provide the major access routes directly from Cooke City to the Absaroka-Beartooth Wilderness. During the summer, there is camping in undeveloped campsites along these roads, especially by off-road vehicle recreationalists and mountain bikers who ride the network of two-track roads in the vicinity. Future mining development would displace such use due to traffic associated with mining. Conflicts between

hunters and mining activities could occur if hunting access in the vicinity of any mine is disrupted. For example, if the New World Project were developed, mine use of the Lulu Pass Road would affect use of the Round Lake Trail and Goose Lake Road, popular for hiking, snowmobiling, skiing, and hunting access.

Change to Recreation Settings. Depending on the location of future exploration and mining, recreation opportunity settings may change. For example, if development occurs in areas classified as semi-primitive (Republic Woody Creek, Sheep Creek, Upper Stillwater, Round Lake and Kersey Lake) the attributes of that setting may change to roaded natural. Under some circumstances, the altered setting may no longer fit into the ROS system because recreation is no longer provided on that site. When recreation settings change, the type of recreation is likely to change as well.

In the study area, direct visibility of mining development activities would eliminate feelings of remoteness and isolation. With sights and sounds of mining, milling, road traffic and a workers camp nearby, feelings of remoteness and isolation are reduced. New facilities would be built solely to support mining purposes and processes. People would be more regulated and controlled near mining activity areas. They may not be allowed access to or near mine areas and supporting roads and facilities. Traffic on roads may become blocked, interrupted or congested. Roads may be built specifically for mine purposes when safety is a high priority. Roads for mining equipment are typically wider than forest roads and may have bermed shoulders for safety. Traffic management may be employed to reduce volume and conflicts in use.

Sensory Effects on Recreational Experiences. Sensory experiences are a substantial determinant of the quality of a recreational experience. This would be especially true for wilderness/backcountry users who are seeking a natural experience without intrusions caused by the presence of man. Examples of sensory effects on the quality of recreational resources include additional noise compared to background (natural) levels, a perception of congestion and crowdedness of the area resulting from mining-related traffic, or artificial night lighting.

The impact of noise and artificial light depends on the location of future mine facilities. The New World Project serves as an example of the types of effects for this area. The noise impact analysis conducted for the NWPPDEIS, (Noise and Electric Field and Magnetic Fields Technical Report), indicates that various levels of noise would be audible in the area surrounding the mine project area and environs during all phases of mine operations. Noise levels of 55 dB(A) or higher would occur in close proximity of project activities.

For reference, a noise level of 55 dB(A) is approximately equivalent to a human voice at normal speech levels.

Recreational users in the immediate project vicinity (e.g., snowmobilers, cross country skiers, hikers, bicyclists, etc. using the Daisy Pass Road or the Lulu Pass Road) would hear audible sounds from project construction and operations at the 40-55 dB(A) levels throughout the proposed project time frame. Noise levels would be even higher with closer proximity to the project site. The effect of this noise on recreational users would be dependent upon individual values, goals, and expectations. Most noise would be less than that produced by snowmobiles. Consequently, it is likely that snowmobilers would be least affected by the increased noise associated with mining. Those seeking to avoid noise would be most affected; it is possible that some users in this category would seek other areas for their recreational opportunities.

The noise analysis indicates that noise might also be heard within the Absaroka-Beartooth Wilderness east of the project site (northeast of Cooke City/Silver Gate). Project-related noise of up to 40 dB(A) during some project phases might be heard from the wilderness boundary, gradually decreasing to inaudible levels further into the wilderness. In some circumstances, project noise might be slightly audible at Lady of the Lake (a primary fishing opportunity) in the wilderness. Those seeking the wilderness attribute of solitude may be affected by this noise, and may have to travel further to avoid this noise. The ultimate effect, again, would depend on individual values, goals, and expectations.

Operation of a major mine requires artificial lighting during the night. In all mine alternatives, lighting would be designed to minimize off-site effects. Night lighting would be visible to recreationist camping or stargazing in the vicinity of the mine, diminishing the feelings of remoteness and solitude.

Local Population Effects on Recreation. As discussed in the Social section of the EIS, the increased population would be due to employees working on future mines, indirect workers, and family members associated with the immigrating miners and service workers. For example, if a mine the scale of the New World Project was developed, the peak projected population increase associated with the project is 320 persons, while the operations phase increase is projected to be 290 persons.

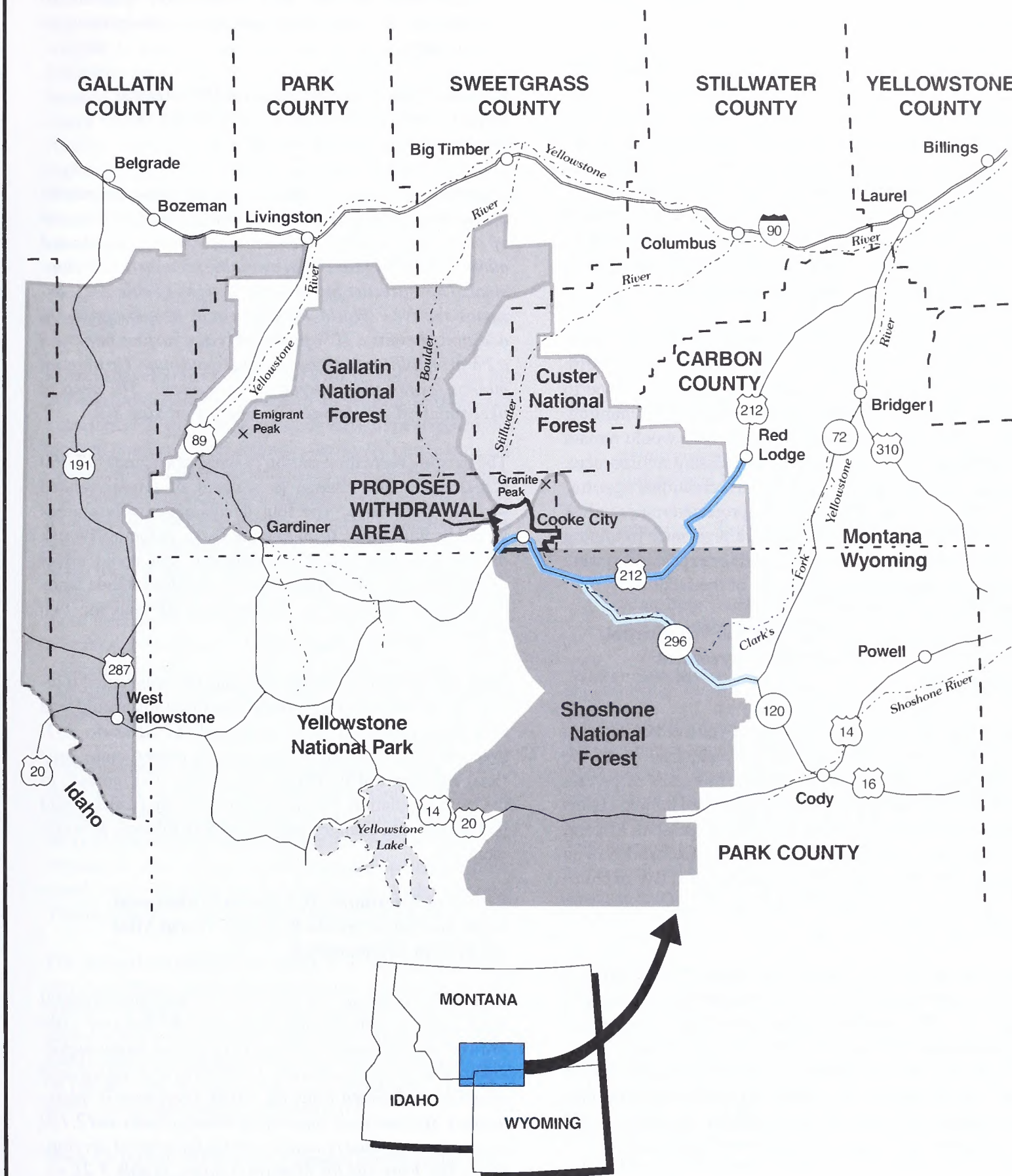
The permanent residency areas of mine workers would be spread among a variety of communities in the relatively large study area (Park County, Wyoming and Park County, Montana). Most of the mine workers would use an on-site workcamp during their work periods at the project site. Therefore, miners would have access to area recreational resources during off-hours while at their residences, off-

hours while at the workcamp, and during their commutes to and from the project site. Service workers and family members also would have ready access to the area's recreational resources.

The presence of new construction and/or operations workers living and working in the region would lead to potential increases in legal and safe hunting, fishing, snowmobiling, hiking, and other recreational activities. Mitigation measures such as non-residency rules (including camping sites) for project-related workers in the Cooke City/Silver Gate area and through the Sunlight Basin corridor, help reduce the potential for long-term camping and unsafe/illegal activities such as poaching, trash disposal, or other problems. Effectiveness of mitigation would be dependent on the availability of additional public lands personnel for monitoring and enforcement.

Area Highways. A change in the amount and type of traffic on area highways would occur with future mining. The magnitude of the change depends on the amount of mining and whether tailings are disposed of off-site. Access to the northeast entrance of Yellowstone NP is provided by U.S. 212 (Beartooth Scenic Byway) and WY 296 (Chief Joseph Scenic Highway) Map 3-6. Both roads may be used for access for future mining. The northeast entrance is the least used of the five entrances, accounting for between 5 and 7 percent of total Park visitation (~3 million) over the past five years. U.S. 212 over Beartooth Pass is closed about seven months of the year during the winter. The overall accident rate on U.S. 212 is comparable to other highways of the same type. The nine mile segment between Yellowstone NP and the Montana/Wyoming State line has a higher than average accident rate. This segment remains in much the same condition as when it was originally built in the 1930s. This segment is too narrow to accommodate existing and projected traffic safely, and the road surface is in poor condition. Sharp curves along portions of the road restrict visibility and create hazardous driving conditions. The Federal Highway Administration has proposed to reconstruct this section of U.S. 212.

Conflicts between large truck traffic and recreational traffic are likely on US 212 and Wyoming 296 and on other area roads such as Miller Creek or the Lulu Pass Road should future mines be developed. Increased traffic on area highways and mine-area roads may make recreational traveling and viewing less acceptable and more dangerous for some persons, depending on individual or group values, goals, and expectations. An increased use by trucks for hauling tailings off-site would be noticeable and considered by many recreationists to be incompatible with the highways' designations as scenic routes. Effects could be partially mitigated by requiring night-hauling on area highways, and by constructing additional vehicle turn-outs.



- Beartooth Scenic Biway
- Chief Joseph Scenic Biway

MAP 3-6
HIGHWAYS AND
ACCESS ROADS

Effects from the Degradation of the Ecosystem and Its Individual Elements. From both a quality of life perspective and the importance of recreation/tourism in the existing economy, negative effects on the health of the ecosystem would result in negative effects on the abundant recreation resource base. Potential effects to wildland recreational resources might result from mining-related effects on hydrology, aquatic habitat and related species abundance, terrestrial wildlife habitat and related species abundance, and vegetation. If the health of one or more of these natural elements of the ecosystem were degraded, the ability to hunt, fish, observe wildlife, sightsee, or engage in other recreational activities could also be affected.

Recreational resources such as hunting and fishing would be affected in some very localized areas where wildlife patterns or fishing opportunities might be altered due to mining. From a broader regional perspective, hunting, fishing and other recreational opportunities would remain basically the same as those within the existing environment. Overall, the vast majority of regional recreational opportunities would not be affected by the projected mines unless recreational users would be in close proximity to mining facilities or if individual values, goals or expectations were adversely affected by the presence of the facilities.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under this scenario, 17,820 acres of federal land remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Forecast for Mineral Activity (Table 3-2) assumes there is a 2% probability of an underground mine and the potential for up to five exploration operations. The area of most likely mineral development is shown on Map 2-2.

The potential for mining-related effects to recreation are significantly reduced due to the NWM Agreement. The New World Project would not be developed and the area of highest mineral potential is no longer available for mining. The risk of effects to recreation experiences and recreation settings is significantly reduced. If a mine were developed on remaining private land or federal land, the effects would be similar to those described above for Scenario A-1.

Depending upon the location of future exploration and mining, existing recreation opportunity settings could change. For example, if development occurred in areas classified as semi-primitive (Republic Woody Creek, Sheep Creek, Upper Stillwater, Round Lake and Kersey Lake) the attributes of that setting may change to roaded natural.

Roadless areas and the area immediately adjacent to Yellowstone NP and wilderness areas remain open to mineral entry.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under this scenario, 17,760 acres of federal lands would be immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims would remain available for mineral development. The Forecast for Mineral Activity (Table 3-2), assumes the New World Project would be developed. In addition, there is a 10% probability of a surface mine and a 2% probability of another underground mine. Up to seven mineral exploration operations may occur. The area of likely mineral development is depicted on Map 2-3.

The existing recreation setting of withdrawn lands (17,760 acres) would not change as a result of mining-related surface disturbance. The four designated roadless areas would be withdrawn from mineral entry, reducing the risk of future mining-related development that could affect roadless values. The withdrawal would also include lands immediately adjacent to Yellowstone NP and the two Wilderness areas.

Mineral development on private land and unpatented mining claims in the central portion of the study area would lead to effects similar to those described for Scenario A-1. Potential effects would include mining-related noise, artificial lighting, traffic, industrial facilities and increase in the local population. Displacement of existing users would be likely due to changes associated with mineral development.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under this scenario, 17,760 acres of unclaimed federal land would be immediately subject to the mineral withdrawal; an additional 4,180 acres of Crown Buttes unpatented mining claims and up to 1,740 acres of acquired land would be withdrawn when the NWM Agreement is implemented. Sixty acres of unpatented mining claims and 2,420 acres of private land remain available for mineral development. The Forecast for Mineral Activity, (Table 3-2), assumes no mines would be developed; one exploration operation is possible.

In general, the recreation settings and opportunities in and around the study area would not be affected by mining-related activity. Opportunities for solitude and primitive

and semi-primitive recreation would be maintained. The risk of degradation of resources including water quality and wildlife is reduced which would help maintain existing recreation uses related to fishing and hunting. There would be no significant influx of workers and support staff associated with a major mine. There would be less potential for conflict with mining related traffic on area roads and highways. Relatively high quality recreational experiences would continue, although continued growth in recreation and tourism may affect recreation resources and experiences.

Conclusion

Mineral development associated with Scenario A-1 has the greatest potential for change to recreation settings and experiences in and around the study area. Industrial activity tends to dominate local settings potentially eliminating the “wildland” character that now exists. The sense of isolation and remoteness would be lost in portions of the area. Future mining is not likely to decrease overall visitation to National Forests or National Parks in the surrounding area. Some users would be displaced due to conflict with noise, traffic, and general mining activity. Other users may be more tolerant or attracted to the area to view a mine in operation. Mining-related traffic, including ore trucks, may make recreational travelling and viewing less enjoyable and perhaps less safe, depending upon individual values and expectations.

Implementation of the NWM Agreement (Scenario A-2) significantly reduces the potential for changes to existing recreation settings and experiences. If a mine is developed on available federal land or private land outside the NWM Agreement area, effects similar to those described above could occur. Federal lands adjacent to wilderness and Yellowstone NP remain open to mineral entry.

The mineral withdrawal (Scenario B-1) would help maintain the existing recreation settings and opportunities. The withdrawal applies to largely undeveloped roadless areas adjacent to the surrounding wilderness. Mineral development is likely to occur in the central portion of the study area on private land and unpatented mining claims. This may affect recreation similar to Scenario A-1.

Since the probability of a major mine is greatly reduced due to the combined effects of the withdrawal and NWM Agreement (Scenario B-2), the potential for effects on existing recreation settings and opportunities from mining would be very low. Recreation use would continue to increase. There would be minimal risk of displacement of users to other areas, and minimal conflict with mining-related traffic or development.

Scenic Integrity

Introduction

The study area is part of the Beartooth Plateau, renowned for its scenic beauty. The vegetation, landforms and geology result in a landscape that is very diverse and highly scenic. Rugged peaks rise above glaciated valleys with numerous wetlands and streams. The mosaic created by the vegetation and landforms is visually pleasing. Scoping comments often refer to the scenic quality of this area. Scenic integrity directly supports wildland recreation experiences. Mining has altered scenic integrity in portions of the study area, however, for the most part, the area still retains high levels of scenic integrity.

Key elements of this assessment include:

- identifying the existing scenic integrity of the natural and cultural landscape of the study area;
- identifying Key Observation Points and viewer sensitivity;
- describing potential alterations to scenic integrity that could result from mining;

Viewer Sensitivity

Viewer sensitivity is a measure of people’s concern for scenic integrity and is often described in terms of viewer expectation, the number of viewers, the importance of the observation point or viewing area, and view duration. Scenic viewing is one of the most common recreation and leisure pursuits of visitors to the study area. Additionally, the majority of outdoor recreation in the study area includes some amount of scenic viewing as a secondary recreation benefit.

Public concern for scenic integrity in the study area is very high. Expectations for high quality, pristine scenery are tied to the visitor’s notions about Yellowstone NP, the Chief Joseph Scenic Highway (WY 296), the Beartooth Scenic Byway (U.S. 212), the Absaroka-Beartooth Wilderness, and the North Absaroka Wilderness. Scenic viewing from automobiles, other forms of motorized and non-motorized recreation, cabins and second homes, surrounding recreation sites, and key observation points and viewing areas heightens viewer expectation. During the summer recreation season, use is greater and visual sensitivity higher.

Study Area Analysis

The amount of any human disturbance and intervention serves as a measure of deviations from the natural land-

scape characteristics and determines an area's existing scenic integrity. (Landscape Aesthetics, A Handbook for Scenery Management, USDA Forest Service, December, 1995, pg 2-4). The degree of naturalness of the landscape and recreational settings may be changed as mining activities become more visually apparent and begin appearing as human-caused alterations to the natural landscape.

For this analysis, Scenic Integrity Levels (SIL) are the frame of reference used to inventory naturalness of the lands being viewed and any alterations to these lands. Scenic integrity levels are comparable to Visual Quality Objectives [VQO]. VQO's are used in the Forest Plans and are used to specify the visual attributes of proposed land management activities.

Description of Scenic Integrity Levels

In either SIL or VQO scales, harsh alterations to the landscape decrease the existing scenic integrity of a natural landscape, while subtle alterations do not. The degree of visual change depends on the location of future mining facilities. In general, visual effects are accentuated on steeper ground, when color or significant contrast is created due to changes in edges, and on higher locations such as ridges or peaks. (Table 3-6, Description of Scenic Integrity Levels.)

TABLE 3-6 DESCRIPTION OF SCENIC INTEGRITY LEVELS

Scenic Integrity Level	Degree of Landscape Alteration	Visual Quality Objective
Very High	Unaltered Landscape	Preservation
High	Appears Unaltered	Retention
Moderate	Slightly Altered	Partial Retention
Low	Moderately Altered	Modification
Very Low	Heavily Altered	Maximum Modification
Unacceptably Low	Extremely Altered	None

Key Observation Points

Ten key observation points were identified (Table 3-7) for the study area. A key observation point (KOP) is a location from which key portions of the study area are visible. The KOPs were selected based on their proximity to the study area, their location in specially designated areas, such as

Yellowstone NP or a designated wilderness, and/or their recreational use. The relative elevation and terrain between an observation point and mine features are the primary determinants of visibility.

Although only ten KOPs were used to complete this analysis, the potential mining would be visible from numerous other locations around the study area. Although there are many observation points, ten were chosen where both public access and visibility warranted their analysis.

Affected Environment

Existing Scenic Integrity and Visual Quality Objectives

Table 3-8 describes the existing scenic integrity for discrete landscape units of the study area. Map 3-7 displays the existing scenic integrity of the area. Map 3-8 displays the existing visual quality objectives for the study area.

Cultural influences have had an obvious effect on the mine area landscape for over a century. The most apparent changes have come from mining activities in the Miller, Fisher, and Daisy Creek drainages. The study area is checkered with old mine workings, tumbled down structures, waste rock areas and open pits, abandoned cabins, and roads which access these various locations. The old mine camps, structures, and cabins contribute to the "sense of place" and character surrounding the Cooke City area (see Chapter 3—*Cultural Resources* for additional information on the area's mine history).

Environmental Effects

Examples of mine facilities that could alter visual integrity include:

- ore-processing mill
- outdoor lighting
- tailings impoundments
- diversion channels
- a temporary waste rock storage areas
- mine adits
- reclamation borrow areas
- ventilation raises
- soil stockpiles
- access roads
- work camps
- electrical powerlines

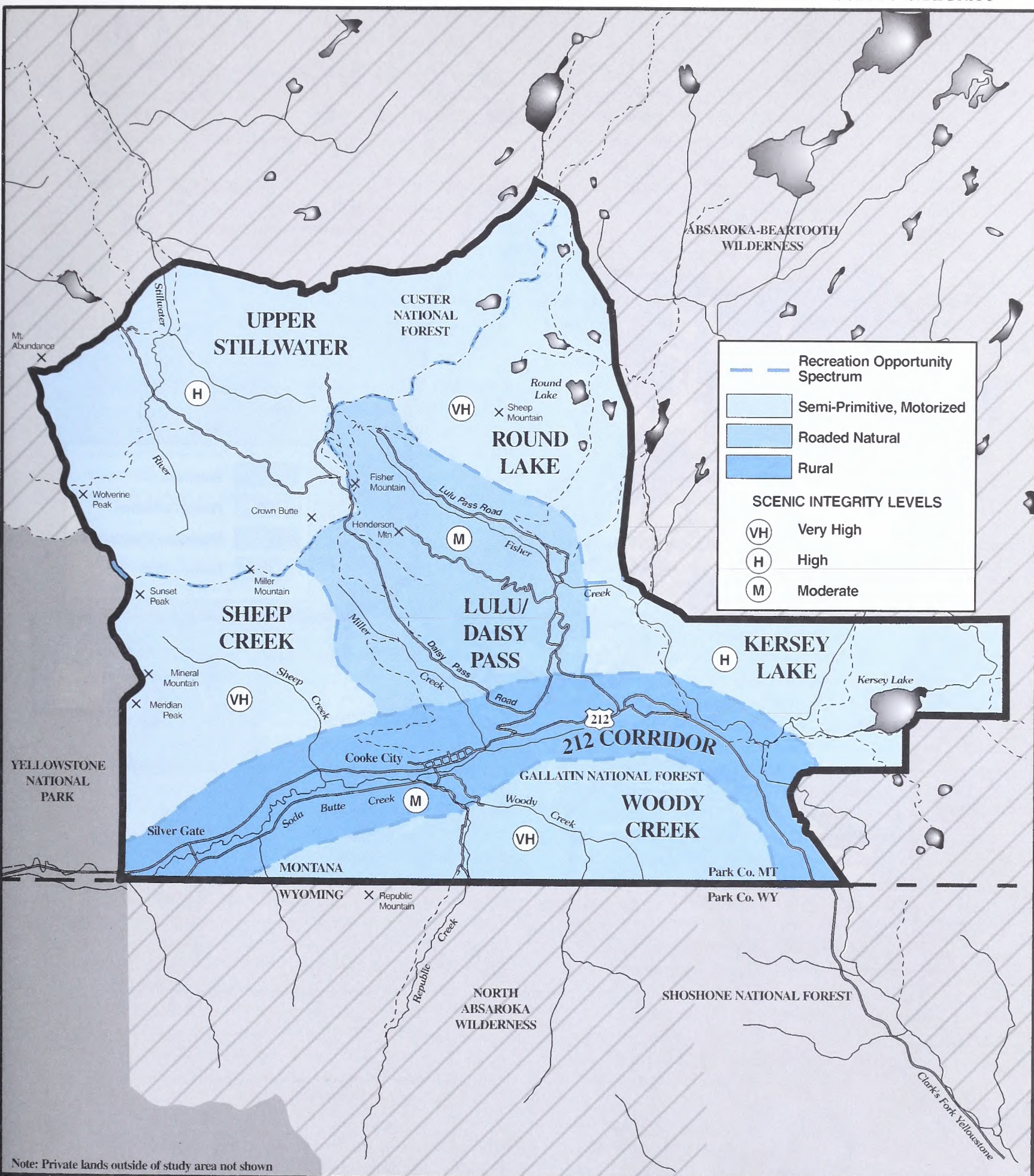
While the analysis of potential visual quality effects is generic as the specific location or size of potential mining-

TABLE 3-7: LOCATION AND USE OF KEY OBSERVATION POINTS

Key Observation Point	Location	Recreational Use	Type of Access	Level of Use
WILDERNESS LOCATIONS				
Lake Abundance	4 miles northwest of Daisy Pass in A-B Wilderness	Hiking, fishing	Pedestrian	Low-moderate
Pilot Peak	4 miles southeast of Cooke City in North Absaroka Wilderness	Climbing	Pedestrian	Very low
YELLOWSTONE NATIONAL PARK LOCATIONS				
Wolverine Peak	Northwest corner of YNP	Hiking	Pedestrian	Very low
Republic Pass	5 miles south of Cooke City on border of YNP	Hiking	Pedestrian	Low
OTHER LOCATIONS				
Daisy Pass	3 miles north of Cooke City, head of Miller Creek and Daisy Creek	Sightseeing; snowmobiling; mountain biking; hunting access	Motorized	Moderate
Lulu Pass	4 miles north of Cooke City, head of Fisher Creek	Sightseeing; snowmobiling; mountain biking; hunting access	Motorized	Moderate
Goose Lake Road	3 miles north of Cooke City near Fisher Creek	Sightseeing; hiking	4-wheel drive	Low-moderate
Lady-of-the-Lake Trailhead	3 miles northeast of Cooke City near Fisher Creek	Hiking	Pedestrian	Low-moderate
Arbor Day Overlook	3 miles east of Cooke City on U.S. 212	Sightseeing	Pedestrian Motorized	High
Clay Butte Lookout	18 miles southeast of Cooke City on U.S. 212	Sightseeing	Motorized	High

TABLE 3-8: SUMMARY OF RECREATION AND SCENIC SETTINGS IN STUDY AREA

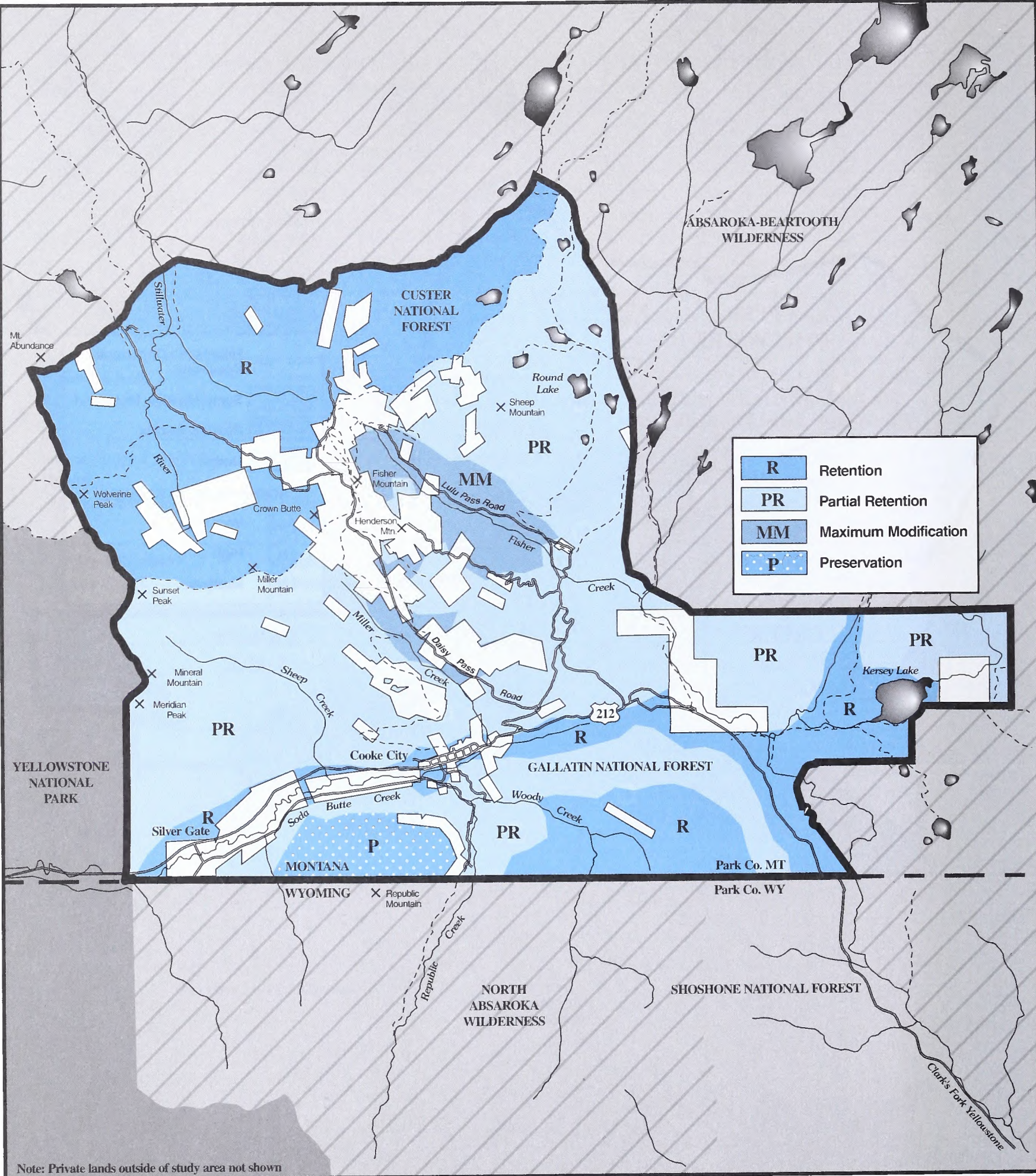
RECREATION SETTINGS	SCENIC INTEGRITY VISUAL QUALITY OBJECTIVE(VQO)	RECREATION OPPORTUNITY SPECTRUM
<i>Republic/Woody Creek</i>	Very high scenic integrity, largely unaltered landscapes, distinctive features including Republic Mountain. VQO-Retention, Preservation, Partial Retention	Semi-primitive, motorized-largely undeveloped and accessed by trail. Republic Mtn recommended for wilderness.
<i>US 212 in study area</i>	Moderate scenic integrity due to developments such as cabins, powerlines, roads. VQO-Retention	Rural-convenient settings, good access; minimal difficulty. Recreation services provided in Cooke City/Silver Gate.
<i>Sheep Creek</i>	Very high scenic integrity; landscapes largely unaltered except by natural forces such as fire. VQO-Partial Retention	Semi-primitive, largely within Mineral Mountain portion of North Absaroka Roadless area. No formal roads or trails.
<i>Lulu/Daisy Pass Loop Road (Fisher & Miller Crk)</i>	Moderately altered landscape due to past mining, roads, and timber harvest. Cultural resources add to scenery. VQO-Max Modification-Partial Retention	Roaded-natural-contact with others due to access; mineral development noticeable; interpretation signing; good viewpoints available.
<i>Upper Stillwater/ Goose Creek</i>	High scenic integrity, some evidence of mining; good panoramic views with little evidence of alteration, distinctive. VQO-Retention	Semi-primitive setting, bisected by Lake Abundance 4-wheel drive trail. Partly within North Absaroka Roadless area.
<i>Round Lake</i>	Very high scenic integrity. Distinctive due to panoramic views and lakes. VQO-Partial Retention.	Semi-primitive, accessed via Goose Lake 4-wheel drive trail. Several lakes with fish. Beartooth roadless area.
<i>Kersey Lake</i>	High scenic integrity, not as distinctive landscape due to flatter, gentler ground. VQO- Retention, and Partial Retention	Semi-primitive, low standard road to Kersey Lake. Surrounded by wilderness on three sides. Several trails access wilderness. Beartooth Roadless area.



- Yellowstone National Park
- Wilderness
- Private lands (not subject to withdrawal)
- National Forest Land

- Study Area Boundary
- Streams
- Trails
- Roads
- National Forest Boundary

MAP 3-7
RECREATION OPPORTUNITY
SETTINGS AND SCENIC
INTEGRITY LEVELS



Note: Private lands outside of study area not shown

		Yellowstone National Park		Study Area Boundary
		Wilderness		Streams
		Private lands (not subject to withdrawal)		Trails
		National Forest Land		Roads
				National Forest Boundary

MAP 3-8

VISUAL QUALITY OBJECTIVES

related facilities is unknown, the visual impacts of the proposed New World Project will serve as example of the type of effects that could with future mining (NWP PDEIS, Chap. 14, Visual Resources).

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under this scenario, all 22,000 acres of federal land in the study area remains available for mineral entry, and up to 4,160 acres of private land is available for mineral development. The Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes, assumes the New World Project is a reasonably foreseeable action (Table 3-2). In addition, there is a 10% probability of a surface mine and a 2% probability of an another underground mine. Up to 10 mineral exploration operations may occur. The area of most likely mineral development is shown on Map 2-1.

Mineral potential for areas like Republic Mountain, Sheep Creek, and the Upper Stillwater River is considered high. Generally, the lands available for mineral entry have high to very high scenic integrity, including roadless lands adjacent to the Wilderness or Yellowstone NP. Future exploration and development could occur on these lands increasing the risk of alteration to existing scenic integrity.

The potential effects of mineral development on scenic integrity depends on the location and extent of future mining. If development occurs in the area of highest mineral potential in the central portion of the study area, effects are most noticable from area access roads such as the Lulu Pass or Daisy Pass roads. Evidence of mining, other than a work camp, may not be noticable from the Beartooth Highway. Mining disturbances may be visible from Clay Butte Lookout, however the effects are ameliorated by the distance. Due to the rugged topography, most of the study area is not visible from Yellowstone Park roads. Mining-related facilities and disturbance may be visible from Republic Pass (accessible by trail) or the ridge that forms the boundary between the Park and the study area. Mining-related disturbances would likely be visible from high peaks in the surrounding area including Pilot Peak, Abundance Peak and other high points in the surrounding wilderness.

Some areas such as Republic Mountain are more sensitive to the potential effects of mineral development. Development there would be highly visible from the Beartooth Highway and Cooke City area.

The proposed NWP serves as an example of how mineral development could affect scenic integrity of the area (NWP PDEIS, Chap 14).

Millsites. Millsites would be about 10 acres in size. The mill complex would include ore processing facilities, administrative offices, a sewage treatment plant and sewer drain field, fuel storage tanks, mill water tanks, a snow storage area, and a pond to store water before discharge. The millsite would appear as a large industrial facility in contrast to the surrounding landscape. The mill would remain throughout operations and during the closure period. The area would be reclaimed when project operations cease.

Outdoor Lighting. Outdoor lighting equipped with reflectors designed to reflect light downward would be visible from various wilderness locations depending on the location of the mill. Night lighting may be visible from various wilderness locations including Lady of the Lake Creek and north and west of Goose Lake. Lighting would affect nighttime recreational activities, such as camping or stargazing in localized areas near the mine facilities. Lighting effects would occur during the life of the mine and cease at the end of operations.

On-site Tailings Impoundment. An on-site tailings impoundment would be one of the largest features of a mine. For example, NWP tailings impoundments could range up to 77 acres in size depending upon the alternative. The dam retaining the impoundment would be built out of crushed rock, gray to tan in color, and would be from 70 to 160 feet high. The dam for the off-site impoundment would be 30 feet tall. (Impoundment and dam characteristics would vary by alternative, additional details are discussed in NWP PDEIS, Chap. 2, Table 2-28). The tailings material would be in gray in color and would generally be covered with water during operations. The impoundment and dam would be covered with snow for 6 to 8 months per year. Both the impoundment and dam would contrast with the surrounding landscape by introducing regular geometric landforms in an otherwise naturally-appearing landscape. The visual effects of the on-site impoundment would occur throughout the life of the project. The on-site tailings impoundment and borrow area would be the dominant landform when viewed from the mine area. The on-site impoundment and borrow area in all mine alternatives except the Off-site Tailings Disposal Alternative would not meet the Forest Service's current visual quality objective for federal land affected by these facilities. These facilities would require a site-specific Forest Plan amendment.

The visual effects of the tailings impoundment and borrow area would be reduced following reclamation. The proposed revegetation plan would return the impoundment surface to near its original texture and color. The downstream faces of the impoundments would be more difficult to reclaim. Reclamation of the tailings impoundment may take many years, and may never blend with the original texture and color. The form and line of the impoundment

site would be altered permanently by the impoundment imposing an unnatural geometric landform on the site.

Diversion Channel. Diversion channels would be necessary around some facilities to divert surface water around them. The channels around most facilities would be small, and would be reclaimed (regraded and reseeded) at the end of operations. In three alternatives (Crown Butte's Proposal, Modified Proposal, and Upper Fisher Creek), permanent diversion of Fisher Creek would be necessary. Because the diversion would be sized to convey the Maximum Probable Flood, the diversion channel would be about 40 feet in width at the top and 25 feet in width at the bottom. Along the bottom would be a 3-foot low-flow channel. The channel would be constructed of crushed rock.

The channel would function and appear as an engineered conveyance channel with little resemblance to a natural drainage. The large length and width of the channel would add to the channel's unnatural character and contrast with the surrounding landscape.

Waste Rock Storage Area. A waste rock storage area would be used for about a 2-to-3 year period while the tailings impoundment is constructed. The temporary site would be 10 to 15 acres in size. While the storage area is being used, it would appear unnatural, because of constant disturbance, piles of light-colored rock and lack of vegetation. After the waste rock is moved to the impoundment, the area would be reclaimed. Waste rock storage areas would not be needed with off-site tailings impoundment alternatives.

Adits. Adits or underground tunnels would provide access to the underground mine. Two of the mine adits would be near the mill and would not be visible. The existing Gold Dust Adit also would be used; it would look similar to existing conditions.

Reclamation Borrow Area. A reclamation borrow area would be about 10 acres in size and would not be excavated until the tailings impoundment is ready for reclamation. It would be located near the on-site tailings impoundment. The borrow area would be benched after use and natural plant succession would be augmented with revegetation as needed. A reclamation borrow area is not needed in off-site tailings impoundment alternatives.

Vent Raises. Vent raises would daylight above the underground mine. Each vent raise would be about 100 square feet in size. The raise opening would be small to prevent animals or people from falling into it. A guard and service structure would be constructed at the top of the raise and would block the view of the raise. The raise would also be constructed and painted to be as unobtrusive as possible. As each of the three raises would be only about 10 feet by 10

feet, they would appear unnatural, but not highly visible. Vent raises would be removed and the area reclaimed at the end of operations.

Soil Stockpile Areas. Soil stockpile areas would be needed to store salvaged soil for use in reclamation. Stockpiles would be about 30 acres in size. These stockpile areas would appear as large unnatural mounds with revegetation and plant succession atypical of the surrounding landscape. At the end of operations, the soil in the stockpiles would be used in reclamation and the area reclaimed.

Access Roads. An access road would be needed to provide access from U.S. 212 to the work camp, mill site, and the impoundment. In all mine alternatives, portions of Lulu Pass Road would be used, and some portions rebuilt to reduce road grade. The access road would be an all-weather gravel road about 25 feet in width. The proposed access road would not be returned to its pre-mine width. The widened road would introduce new cut slopes uncharacteristic of the natural landscape.

Work Camp. With Crown Butte's Proposal, the work camp would be located along lower Fisher Creek below the tailings impoundment. In all other mine alternatives, it would be near U.S. 212. This work camp location near US 212 would be visible from several nearby locations along the Beartooth Scenic Byway. The work camp, about 10 acres in size, would include three dormitories, a kitchen and food service area, a recreation building, parking, a sewage treatment plant and drain fields, a wastewater treatment plant, water tank, and snow storage areas. Buildings would be painted to reduce visual contrast. At the end of operations, the work camp area would be reclaimed.

Powerline. A 24-kV powerline would be constructed from the Cooke City substation to the work camp and mill site. The line would require 25-foot maintained right-of-way. Single poles would be erected at distances of between 35 and 45 feet. Though alignment selection and the use of appropriate materials and colors would minimize the visual effects of the powerline, it would be visible from segments and points along the access road (Lulu Pass Road or Daisy Pass Road). At the end of operations, the 24-kV distribution line would be removed and the right-of-way reclaimed.

Effects of Future Mining on Cultural or Historical Landscapes. Future mining could affect the cultural and historic landscapes. Using the New World Project as an example, all of the mine alternatives would affect existing cultural or historic landscapes within Fisher, Miller, or Daisy creek drainages. The new mine facilities would be inconsistent with the existing historical landscape. Three mine alternatives would substantially alter the visual character of the Fisher Creek drainage: Crown Butte's Proposal, Modified Proposal, and Upper Fisher Creek.

In these alternatives, a large tailings impoundment and other mine facilities would be located in Fisher Creek. Fisher Creek contains a large number of historic sites that contribute to the overall setting and feeling of the area. With a large impoundment and other facilities in Fisher Creek, the area would no longer be able to convey a sense of time and place, or to represent a historic period.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under this scenario, 17,820 acres of federal land and 2,420 acres of private land remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Forecast for Mineral Activity, assumes there is a 2% probability of an underground mine and the potential for up to five exploration operations (Table 3-2). The area of likely mineral development is shown on Map 2-2.

Implementation of the NWM Agreement significantly reduces the potential for mineral development in the study area. Scenic integrity of the lands acquired through the NWM Agreement would be maintained or improved with planned reclamation of the Como and McLaren Pits.

Mineral potential for areas like Republic Mountain, Sheep Creek, and the Upper Stillwater River is considered high. Generally, the lands available for mineral entry have high to very high scenic integrity, including roadless lands adjacent to the Wilderness or Yellowstone NP. Future exploration and development could occur on these lands increasing the risk of alteration to existing scenic integrity. Depending upon the nature and extent of any future development, the effects on scenic integrity could be similar to those described under Scenario A-1. The probability of future development on lands remaining open to mineral entry is low (Mineral Forecast , Appendix B).

Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under this scenario, 17,760 acres of National Forest lands are immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims remain available for mineral development. The Forecast for Mineral Activity, (Table 3-2) assumes the New World Project is a reasonably foreseeable action. In addition, there is a 10% probability of a surface mine and a 2% probability of an another underground mine. Up to 7 mineral exploration operations may occur. Area of likely mineral development is depicted on Map 2-3.

Unclaimed federal land that would be subject to the withdrawal consists of generally roadless lands with high to very high scenic integrity. Scenic integrity of the Reef and Republic Mountain area, Sheep Creek, Kersey Lake and the Goose Lake area would not be affected by mining. The potential for mining-related scenic alteration adjacent to wilderness or Yellowstone NP would be eliminated by the withdrawal.

Development likely to occur on private land and existing unpatented mining claims in the central portion of the study area would result in effects similar to those described for Scenario A-1. In general, the effects on scenic integrity would be concentrated in the area where the most alteration has occurred due to previous mining.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented.

Under this scenario, 17,760 acres of unclaimed federal land are immediately subject to the mineral withdrawal and up to 1,740 acres of Crown Butte's private minerals and 4,180 acres unpatented mining claims are withdrawn when the NWM Agreement is implemented. Sixty acres of unpatented mining claims and 2,420 acres of private land remain available for mineral development. The Forecast for Mineral Activity, assumes no mines would be developed and one exploration operation is possible (Table 3-2). Area of likely mineral development is depicted on Map 3-4

The mineral withdrawal combined with the NWM Agreement would tend to minimize any mining-related changes to scenic integrity. The semi-primitive recreation opportunity settings and roaded natural appearing and rural settings are maintained in part because scenic integrity is maintained at high levels.

Historical mine disturbances and roads have altered the visual quality in the study area. Reclamation planned under all scenarios may improve scenic integrity of currently disturbed sites. Widening U.S. 212 may reduce the visual quality of the area.

Conclusion

Under Scenario A-1, federal lands with high scenic integrity including roadless areas and lands adjacent to wilderness and Yellowstone NP remain available for mineral entry. Potential mineral-related development, including facilities such as mills, stockpiles, tailings impoundments, workcamps, access roads, and heavy traffic on those roads, would be visually inconsistent with the surrounding landscape. While some effects occur during the life of the

project and are mitigated with reclamation, others, such as tailings impoundments, could have a long-lasting effect.

Under Scenario A-2, there is a reduced potential for major changes to scenic integrity of the area. Mineral development could still occur on undeveloped lands with high scenic integrity adjacent to Yellowstone NP and the wilderness areas.

Scenic integrity of federal lands withdrawn from mineral entry would not be altered as a result of future mining (Scenario B-1). Generally, these lands are undeveloped lands with high scenic integrity. Mining is likely to occur on private land and unpatented mining claims in the central portion of the study area. Alteration to scenic integrity would be concentrated in the Daisy Pass/Lulu Pass setting. This would lead to effects similar to those described under Scenario A-1.

Scenario B-2 presents the least risk of scenery alterations, since the potential for a major mine is significantly reduced due to the combined effect of the mineral withdrawal and the NWM Agreement. Scenic integrity may be improved with additional reclamation of disturbed sites.

Yellowstone National Park

Introduction

The following section summarizes the lead agencies' analysis of potential effects of a mineral withdrawal on resources and values in Yellowstone NP. The following issues are discussed: changes in recreation, traffic, general operations, visual resources, noise; and the World Heritage Site and Biosphere Reserve designations.

For additional information on the potential effects to Yellowstone NP refer to the following sections of this EIS: Wild and Scenic Rivers, Surface Water Quality and Quantity, Aquatics, Air Quality and Wildlife.

Affected Environment

The National Park Service (NPS) administers Yellowstone NP which borders approximately 3 miles of the southwest boundary of the proposed mineral withdrawal (Map 1-2). By Act of Congress on March 1, 1872, Yellowstone NP was "...dedicated and set apart as a public park or pleasuring-ground for the benefit and enjoyment of the people" and "for the preservation, from injury or spoilation, of all timber, mineral deposits, natural curiosities, or wonders...and their retention in their natural condition."

Recreation and Tourism

Visits to Yellowstone NP increased from 1986 to 1995. In 1988, visitation hit a ten year low, down 15 percent from average visits during the period. The low can be attributed to the Yellowstone fires during the summer of 1988. In 1993, visitation dropped slightly, but increased in 1994 and 1995. In 1995, visitation was slightly more than 3 million visitors. The National Park Service has projected that visitation will increase to 4.2 million visits annually by 2002. Visitation beyond the year 2002 has not been estimated by the Park Service. (National Park Service, U.S. Dept of the Interior, Fishing Bridge Draft Environmental Impact Statement.)

Of the five Park entrances, the northeast entrance receives the least number of visitors, about 5 to 7 percent of the total. The northeast entrance has had the greatest percentage increase in visitors of the five Park entrances. This could partially be due to rerouting of visitors from the Park's east entrance because of reconstruction and associated traffic delays and temporary closure of the east entrance road in the Park, and to the re-introduction of the gray wolf into the Lamar Valley. U.S. 14/16/20 east of Cody, Wyoming, is also undergoing reconstruction and may influence visitors to enter the Park through the northeast entrance.

Refer to the Recreation section of this Chapter, for a more detailed description of the importance of recreation in this area.

Access to the northern part of the Park is provided by two highways. U.S. 212 provides access to the northeast entrance near Cooke City, Montana, and U.S. 89 provides access to the north entrance, near Gardiner, Montana. The Mammoth/Silver Gate Highway system connects the two entrances. Yellowstone NP plans to resurface the Silver Gate to Tower Junction portion of this road beginning in 1997 (National Park Service, 1996c). Because U.S. 212 east of Cooke City is currently closed in the winter and early spring, commercial and private access is allowed through the Park between Gardiner and Cooke City.

Park planners are currently undertaking various studies to assess effects of growing recreation use. Preliminary study findings will be made available for public review during the 1996-97 winter. Alternatives being studied include increases in certain types of use in certain places, decreases in certain types of use, and the status quo. The Park has also initiated an evaluation of summer visitor use management through completion of an Alternative Transportation Modes Feasibility Study (National Park Service, 1994). This study looks at the suitability of alternatives to the private automobile, such as bus, light rail, and monorail, for allowing visitors to enjoy the features of the Park.

Noise

Measured ambient sound levels in the Park currently range from 25 to 40 decibels. Decibels are units of measure for noise. Decibel levels associated with commonly heard sounds include 85 to 120 decibels for snowmobiles, 60 decibels for a normal conversation, and 30 decibels for a whisper. (These levels are based on the source being 50 feet away). Nighttime noise levels in the Park are lower than daytime noise levels. In areas receiving little human use in Yellowstone NP, noise levels are very low, generally below 20 decibels.

In some Park locations, traffic noise, particularly in the summer, and snowmobile noise in the winter, are audible. In the Park's northeast corner, primary sound sources are vehicle traffic on the Tower Junction/Northeast Entrance Highway and U.S. 212; chainsaw sounds from occasional firewood cutting on private and National Forest lands near the Park's northeast entrance; and snowmobiles on private and National Forest lands adjacent to the Park. The Daisy Pass and Lulu Pass areas, about 3 miles east of Wolverine Pass, are very popular snowmobile areas. These sources of noise are typically short-term and seasonal in nature.

Park Operations

Historically, Yellowstone NP has provided many community services to residents of Cooke City and Silver Gate through a cooperative agreement with Park County, Montana. The services currently provided include road maintenance and plowing of U.S. 212 from the Park boundary (northeast entrance) to the east end of Cooke City (year-round); spring opening of U.S. 212 from Cooke City to the Montana/Wyoming State line (mile post 43.1); road maintenance and plowing from Cooke City along U.S. 212 to the Montana/Wyoming State line (early May to November 1); emergency medical services; solid waste collection (year-round); and emergency law enforcement.

Law enforcement and medical emergency services along U.S. 212 between the Park boundary and the Montana/Wyoming State line are primarily provided by NPS law enforcement services (NPS communications center with its 911 emergency call service and the NPS northeast entrance ranger station). It is common for the Park's road crew to be the first upon an accident scene and contact the necessary law enforcement or medical personnel. Although case load data for these services are not available, the Park Service estimates it spends about \$235,000 per year to provide services to the area (Yellowstone NP, 1994).

NPS has recently begun discussions with Park County, Montana, for the County to assume full responsibility for providing law enforcement, emergency medical services,

road maintenance and plowing, and solid waste disposal for the communities of Cooke City and Silver Gate.

Scenic Integrity

The study area is visible from some higher elevation locations along the northeast boundary of the Park. The study area is briefly visible from Park roads as you leave and enter the Park. The only Park hiking trail offering a view of the study area crosses Republic Pass about 6 miles south of the project. Existing Cooke City developments, U.S. 212, with its proposed reconstruction, and the Daisy Pass and lower Lulu Pass Roads also are visible from Republic Pass. At night, night lighting of Cooke City and development along U.S. 212 is visible from Republic Pass. The amount of night-time recreational activity in this area is low.

A portion of the study area is also visible from Wolverine Peak, a high-elevation peak forming the northeast corner of the Park. The number of backcountry users of Republic Pass and Wolverine Peak is low. Some historical mine disturbances, such as the McLaren Pit, also are visible from Wolverine Peak. These disturbances, which are in the process of being recontoured and revegetated with native plants (reclaimed), will eventually blend with the surrounding landscape.

World Heritage Site

As a result of the International Convention for the Protection of the World Cultural and Natural Heritage adopted in 1972 by the General Conference of UNESCO (United Nations Educational, Scientific and Cultural Organization), the World Heritage Committee was established. The World Heritage Committee is responsible for implementing the principles of the Convention, to promote international cooperation in safeguarding the cultural and natural heritage of mankind. The Convention and implementing regulations require evidence that legal protections necessary to ensure the preservation of the Park and its environment are available.

Yellowstone NP was designated a World Heritage Site in 1978 for both its cultural and natural properties. The site is a cultural property because its role as the first National Park in the United States was of outstanding importance in terms of influence on subsequent National Park developments throughout the world. The Park met all four criteria for natural properties:

- Evolutionary History of the Earth: volcanism evident throughout the Park as an example of the evolutionary history of the earth;

- Evolution of Geological and Biological Processes: the hot springs and geysers as examples of on-going evolution of geological processes, and the naturally managed ecosystems as examples of on-going evolution of biological processes;
- Superlative Natural Phenomena...or Exceptional Natural Beauty: the hot springs and geysers as well as the Grand Canyon of the Yellowstone River are examples of superlative natural phenomena or areas of exceptional natural beauty; and
- Habitats Where Rare or Endangered Species of Animals Survive: Yellowstone's large area containing watersheds and intact ecosystems unaffected by human activity as examples of habitats where populations of rare or endangered species still survive.

In February 1995, a group of 14 organizations requested the World Heritage Committee "...to initiate an investigation to determine whether Yellowstone NP should be included on the List of World Heritage in Danger." Their main concern focused on the threats presented to the Park by the proposed New World Project. In a letter dated June 26, 1995, responding to an inquiry from the Committee, the Assistant Secretary of the Interior wrote, "the Committee should be informed that the property (Yellowstone NP) as inscribed on the World Heritage List is in danger" (U.S. Department of the Interior, 1995).

In December 1995, the World Heritage Committee decided the following, "On the basis of both ascertained and potential dangers, the Committee decided that Yellowstone NP be placed on the List of World Heritage in Danger and that the Committee should request continuing reports on the results of the NWP EIS and mitigating actions being taken to ensure in due course the removal of the site from the List of World Heritage in Danger."

The Committee noted that potential threats to the Park related to proposed mine-related activities are effects on quantity and quality of ground and surface water. Approval of the future mining would be contingent upon compliance with the Montana Water Quality Act and the 1994 water rights compact between the State of Montana and the United States. The compact establishes the water rights of the National Park Service to all of the flow remaining in Soda Butte Creek after satisfying existing consumptive uses. Under Montana's Water Quality Act, Soda Butte Creek in the Park is considered an outstanding resource water and no degradation is allowed.

The Park as a Biosphere Reserves

Biosphere Reserves are established under the Man and Biosphere Program of the United Nations Educational,



Soda Butte Creek, Yellowstone National Park, downstream from study area.

Scientific and Cultural Organization. The program is designed to provide a worldwide network of representative areas for the conservation, monitoring and research on the interaction of man and the environment, education and training, and demonstration of methods of sustainable use of ecosystems. Four criteria are used for selecting Biosphere Reserves: (1) representativeness, (2) diversity, (3) naturalness, and (4) effectiveness as a conservation entity. The Park's designation was based on the unaltered, natural condition and ecological integrity of the area. Although participation in the Biosphere Program is voluntary, Biosphere Reserves are internationally recognized as being important to the world's environment.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under this scenario, all 22,000 acres of federal land in the study area remains open to mineral entry, and up to 4,160 acres of private land is available for mineral development. The Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes, assumes the New World Project is a reasonably foreseeable action (Table 3-2). In addition, there is a 10% probability of a surface mine and a 2% probability of an another underground mine. Up to 10 mineral exploration operations may occur. The area of most likely mineral development is shown on Map 2-1.

Mining would increase use of the Park's recreational resources (especially in the northeast corner) to the some extent. The increase would be due to the improved winter-spring access from the Cody and Billings area resulting from the snowplowing of U.S. 212 between Cooke City and

Wyoming 296, increased population in the study area associated with the project, familiarity of mine workers and their families with recreation opportunities nearby, and displaced recreational users from areas near the proposed project site. Correspondingly, use of the northeast gate as an entrance into the Park would increase. The magnitude and exact location of the increase in use is very difficult to predict or quantify.

Depending on the magnitude, changes in visitation through the northeast entrance would require changes in general Park operations. The associated effects on the Park may include: increased need for road upgrading and maintenance in the northeast part of the Park, increased need for additional staff and housing near the northeast entrance, and shifting of other resources and management priorities to deal with the changing visitor patterns. The NPS would likely transfer full responsibility for community services and road maintenance in the Cooke City/Silver Gate area to Park County, Montana.

Mining would cause a slight increase in traffic through the Park due to mine workers commuting to permanent residences in Gardiner and Livingston. Traffic also could increase due to snowplowing of US 212, providing additional winter/spring access from Cody and Billings. The Park Service has authority to mitigate effects through its regulations for controlling commercial traffic through the Park.

Mining-related noise, depending upon the location of the mine, could be audible in the Park. Those recreationists who hike to Wolverine Peak or adjacent ridges that form the Park's northeast boundary would hear sounds associated with mine construction, operation, and closure/reclamation. Mining-related noise, in contrast to other noise sources, typically occur 24 hours/day and throughout most of the year. Noise levels would occur during the life of mining operations in the area.

Other existing sounds from recreational driving, snowmobiling and occasional firewood cutting near the Park boundary by local residents would continue. In addition, future short-term noise would be heard in the Park. Sources include sounds from operating heavy equipment during proposed reconstruction of U.S. 212 and Park roads and ongoing reclamation/cleanup of historical mining disturbances.

Depending upon the location of future mines, facilities may be visible from the Republic Pass and the Wolverine Peak area of the Park. Similarly, night lighting would be visible during recreational activities, such as camping or stargazing, in localized areas near the mine facilities. In all mine alternatives, lighting would be designed to minimize off-

site effects. Lighting effects would occur during the life of the mine and cease at the end of operations.

The visibility of the mine facilities would be in addition to existing disturbances. In all mine alternatives, the existing McLaren Pit in the short term, and portions of the Daisy Pass Road in the long term, would be visible from Wolverine Peak. Cooke City; U.S. 212, with its proposed reconstruction; and the Daisy Pass and lower Lulu Pass roads would continue to be visible from Republic Pass and adjacent areas in the long term.

World Heritage Site and Biosphere Reserve. Potential effects and mitigating actions from the future mining on Yellowstone NP resources are described in other referenced chapters. Specifically regarding effects on quantity and quality of ground and surface water, the potential risks are described in detail in Sections 3, Surface Water Quality and Quantity. It would be up to the World Heritage Committee to make the determination whether those described potential effects from the mine, individually or cumulatively with the other potential and ascertained threats identified by the Committee, would cause the Committee to retain the Park on the List of World Heritage in Danger, remove the Park from the List of World Heritage in Danger, or to delete the Park from the World Heritage List.

Future mining would not have any effect on the Cultural properties, geothermal features and scenic beauty of Yellowstone NP. In any mine proposal, Yellowstone would remain as the nation's and the world's first National Park. Potential effects of future mining on grizzly bears (classified as a threatened species under the Endangered Species Act) are summarized in Wildlife section. Potential effects on the gray wolf (classified as a nonessential experimental population under Section 10(j) of the Endangered Species Act) is also summarized in the Wildlife section. A summary of effects to other wildlife species is located in the Wildlife section. The consultation process between the U.S. Forest Service and U.S. Fish and Wildlife Service regarding threatened and endangered species is discussed in Appendix E.

It would be up to UNESCO/Man and His Biosphere, the body responsible for designating the Park as a Biosphere Reserve, to make the determination whether the potential effects and risks associated with mining merit withdrawing the Park from the Biosphere Reserve network.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under this scenario, 17,820 acres of federal land and 2,420 acres of private land remain available for mineral entry.

Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Forecast for Mineral Activity, assumes there is a 2% probability of an underground mine and the potential for up to five exploration operations (Table 3-2). The area of likely mineral development is shown on Map 2-2.

Under the terms of the NWM Agreement, the area with the highest mineral potential would not be available for mining. However, federal lands adjacent to Yellowstone NP would remain open to mineral entry. Future mining could occur near the Park resulting in effects described above as well as in other sections of this EIS. However, the likelihood of a major mine is significantly reduced with the NWM Agreement. Therefore, there is less risk of potential resource effects or changes to the current situation from future mining.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under this scenario, 17,760 acres of federal lands are immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims remain available for mineral development. The Forecast for Mineral Activity, (Table 3-2) assumes the New World Project is a reasonably foreseeable action. In addition, there is a 10% probability of a surface mine and a 2% probability of an another underground mine. Up to 7 mineral exploration operations may occur. Area of likely mineral development is depicted on Map 2-3.

With this scenario, federal lands immediately adjacent to Yellowstone NP would not be available for mining. Existing levels of scenic integrity and recreation settings would not change as a result of mining. However, mineral development in the central portion of the study area including the NWP could have effects to Yellowstone NP similar to Scenario A-1.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under this scenario, 17,760 acres of unclaimed federal land are immediately subject to the mineral withdrawal and up to 1,740 acres of Crown Butte's private minerals and 4,180 acres unpatented mining claims are withdrawn when the NWM Agreement is implemented. Sixty acres of unpatented mining claims and 2,420 acres of private land remain available for mineral development. The Forecast for Min-

eral Activity, assumes no mines would be developed and 1 exploration operation is possible (Table 3-2). Area of likely mineral development is depicted on Map 2-4.

The mineral withdrawal combined with the NWM Agreement results in the withdrawal of over 99% of federal lands and up to 1,700 acres of private land with high development potential. The likelihood of a major mine is very low with this Scenario. Consequently, this option tends to maintain the status quo in terms of potential effects to Yellowstone NP. The risk of potential conflicts from noise, artificial lights, increases in local population, changes to visitation, and changes to water quality and quantity are significantly reduced.

Existing noise levels at any Park location would not be affected by mining related noise. Existing sound sources, such as snowmobiles in the winter and noise from highway traffic, would remain. Future short-term noise sources include sounds from heavy equipment used in continuing cleanup and reclamation of historical mine disturbance in Daisy Creek drainage. These would be audible to visitors to Wolverine Peak, probably during the summers for 1- to 2-year period.

Views from any Park location are less likely to be affected by future mining. The existing McLaren Pit would still be visible from Wolverine Peak in the short term. Cooke City, U.S. 212, with its proposed reconstruction, and the Daisy Pass and lower Lulu Pass Roads would continue to be visible from Republic Pass and adjacent areas in the long term.

The Proposed Action would reduce the risk of potential adverse effects on the Park's resources, values, and characteristics for which it was designated a World Heritage Site and a Biosphere Reserve.

Cumulative Effects Common to All Scenarios

Visitation to the Park would continue to increase. The increase in visitors would increase stress on Park resources. Commercial traffic through the Park to Cooke City in the winter would continue. Traffic on the Mammoth/Silver Gate Highway would continue to increase during summer/fall months in response to increased Park visitation. Highway reconstruction projects in Yellowstone Park and on U.S. 212 would reduce accidents and improve access.

Some of the ascertained and potential threats to the Park cited by the World Heritage Committee would remain at least for the near future, even in the absence of future mining. It would be up to the World Heritage Committee to decide whether to change the status of Yellowstone NP on the List of World Heritage in Danger.

Conclusion

Mineral development forecasted for Scenario A-1 poses the risk of water quality and quantity changes to Soda Butte Creek. Underground mines in the Miller Creek drainage could contaminate ground water due to the potential for acid rock drainage. Risks can be reduced but not eliminated by design and enforcement of standards. Future mining may slightly reduce streamflows in Soda Butte Creek. However, a water rights compact between Yellowstone NP and the State of Montana requires that any flow reduction be mitigated. Tributaries to Soda Butte Creek including Sheep, Woody, and Republic Creeks remain available for mineral entry. Any future development could effect water quality in Soda Butte Creek.

With Scenario A-2, the risk of water quality, quantity and streamflow changes in Soda Butte Creek would be reduced because the area of highest mineral potential is no longer available for mining. Mining that could occur in portions of the drainage that remain available for mineral development could pose a risk to water quality and quantity in Soda Butte Creek.

Sheep, Woody and Republic Creek drainages are largely withdrawn from mineral entry under Scenario B-1. Mining likely to occur in the Miller Creek on private land and unpatented mining claims poses a risk to groundwater quality and flow reductions as described above for Scenario A-1.

Scenario B-2 poses the least risk to water quality impairment or flow reduction in Soda Butte Creek, since the potential for future mining is very low.

Summary of Effects for Other Yellowstone NP Issues

Park Operations. The development of a major mine is likely if the NWM Agreement is not implemented. Plowing snow off US 212 east of Cooke City would increase winter and spring traffic to the northeast corner of Yellowstone NP, increasing recreation use. There may be an increased need for road upgrading and maintenance in the northeast part of the Park, increased need and additional staff and housing near the northeast entrance, and shifting of other resources and management priorities to deal with changing visitor patterns. The development of a mine may lead to additional need for services currently provided by the NPS. Mitigation associated with the development of a mine may help provide for these services.

With Scenario B-2, US 212 would not be plowed resulting in no increase in winter/spring traffic due to snowplowing. Traffic increases related to an influx of mine workers would not occur. Winter recreation will continue to increase in

Yellowstone NP but at a slower rate than if there was year-round access from Cody/Billings. Local communities, Park County and the NPS will continue to need long term solution to providing services in the area. Changes in Park operations due to mine development would not be necessary.

Visitation/Visitor Experiences: Noise, Scenic Integrity. If a major mine is developed (Scenario A-1, B-1), visitation may increase due to year-round access and the increase in local population associated with a mine. There is no evidence to suggest a decline in visitation to Yellowstone NP would occur due to mine development. Depending upon where development occurs, noise from mining activity may be heard from ridges along the Park boundary, and mine facilities may be seen from Yellowstone NP in the Republic Pass or Wolverine Peak area. Artificial lighting would be visible at night from these locations.

Under Scenario B-2, introduction of mining-related noise, scenic alterations, increases in traffic, and population increases are least likely to occur.

Air quality and visibility. Yellowstone NP is designated as a Class 1 airshed under the Prevention of Significant Deterioration (PSD) program of the Clean Air Act. Air quality and visibility standards in Yellowstone NP are not expected to be exceeded with future mining.

World Heritage Site and Biosphere Reserve. If a major mine is developed in the Henderson Mountain area (Scenario A-1, B-1) there is risk of water quality and quantity changes in Soda Butte Creek. Potential adverse effects to water quality and quantity have been summarized previously. Scenario B-2 reduces the potential for future mineral development and any associated effects in the Soda Butte drainage. The Park's status on the List of World Heritage sites in danger is determined by the World Heritage Committee. There is no effect anticipated on the Biosphere Reserve designation.

Wilderness

Introduction

The proposed withdrawal area is bordered on the east, north, and west by the Absaroka-Beartooth (A-B) Wilderness. The North Absaroka Wilderness on the Shoshone National Forest borders the study area to the south. The Wilderness Act directs land managing agencies (such as the U.S. Forest Service) to protect the natural character of the wilderness and to provide for recreational, scenic, scientific, educational, cultural, and historical uses of wilder-

ness. The Wilderness Act defines four requisite attributes of wilderness including natural integrity, apparent naturalness, outstanding opportunities for solitude, and opportunities for primitive recreation.

These attributes are applied to the conditions inside the boundaries of the wilderness. Although the experience of wilderness visitors might be affected by activities outside the wilderness boundary, the Wilderness Act does not require that adverse effects associated with those activities be mitigated.

The final boundaries of both wildernesses were established for many reasons. The most obvious were to include those areas with most outstanding wilderness qualities. The study area was excluded due to presence of private land, access roads, and mineral potential. The boundaries were also adjusted to fit the terrain and facilitate management of the area. Areas were also excluded to provide for non-wilderness values such as motorized recreation and to allow for wildlife habitat improvement projects.

Affected Environment

Absaroka-Beartooth (A-B) Wilderness

There are 580,562 acres of this wilderness on the Gallatin NF and 346,812 acres on the Custer NF. This wilderness includes the Absaroka Range to the west and the Beartooth Range to the east. The Beartooth Mountain Range contains some of the most rugged terrain in Montana. Elevations range from 5,200 feet on the Stillwater River to 12,800 feet on Granite Peak. Peaks, glaciers, deep canyons, and high tundra plateaus dominate the landscape. Numerous lakes dot the high and often treeless plateaus.

In 1995, total recreation use reported for the Wilderness was 514,000 RVD's (Recreation Visitor Days), the most heavily used wilderness in the Northern Region of the Forest Service. The study area serves as a wilderness portal to 11 trails that access the A-B Wilderness including the popular Clarks Fork Trail (USFS #567), Lady of the Lake Trail (USFS #31), Goose Lake Trail (USFS #25), and Lake Abundance Trail (USFS #84).

Grizzly bear are found along the southern boundary of the Absaroka-Beartooth Wilderness. Two rivers, the Stillwater and the Clarks Fork of the Yellowstone originate in the study area and enter the A-B Wilderness. Upon leaving the study area, 20 miles of the Stillwater River and about 1.5 miles of the Clarks Fork flows through the A-B Wilderness. No degradation in water quality is allowed where these rivers enter the Wilderness as defined by Montana water quality regulations.



Absaroka-Beartooth Wilderness north of study area, near Goose Lake.

North Absaroka Wilderness

The North Absaroka Wilderness is situated along the north-eastern boundary of Yellowstone NP, just south of the study area in Wyoming. The Wilderness is 350,488 acres in size and accessed by 217 miles of trails.

Terrain is characterized by rugged mountains of volcanic origin, dissected by numerous creeks. Due to the volcanic geology of the Wilderness, there exists only a handful of very small lakes. The numerous streams contain fisheries for cutthroat, rainbow, brook, and brown trout. There are populations of bighorn sheep, elk, moose, and grizzly bear. Golden eagles are frequently observed and marmots and pika reign on the talus slopes of the subalpine and alpine ecosystems within the Wilderness.

The main use of the North Absaroka Wilderness is also for primitive recreation, with some livestock grazing taking place. The Republic Creek Trail provides access from the study area to the Wilderness.

Environmental Effects

Sources of potential effects include changes in wilderness water quality due to potential mining upstream in the study area. Artificial lighting and noise from mining operations could affect solitude and primitive recreation within the Wilderness. Population increases associated with mine development could lead to increased wilderness use and reduced opportunity for solitude.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under this scenario, all 22,000 acres of federal land in the study area would remain available for mineral entry, and

up to 4,160 acres of private land is available for mineral development. The Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes the New World Project is a reasonably foreseeable action. In addition, there is a 10% probability of a surface mine and a 2% probability of an another underground mine. Up to 10 mineral exploration operations may occur. The area of most likely mineral development is shown on Map 2-1.

A mine proposal would not directly disturb any lands managed as wilderness. Mining or mining facilities such as tailings impoundments are possible in the upper Stillwater and Clarks Fork drainages that eventually flow into the Absaroka-Beartooth Wilderness. No degradation of water quality is permitted for waters that enter wilderness. With water treatment and other mitigation, surface water quality standards would be met. However, risk factors including potential for acid-rock drainage, uncertainty about the ability to treat all groundwater contamination, and potential failure of facilities or planned mitigation all pose risks to water quality in wilderness. The severity, nature, and extent of any effects of failure would depend on several factors:

- the mode and magnitude of failure;
- proximity of the impoundment to an active stream;
- volume of tailings and effluent released;
- volume of streamflow; and
- composition of the tailings and effluent.

The wilderness experience is highly personal and individual, so the effects would be perceived differently by different individuals. Potential mineral development would have adverse effects on the wilderness experience of some individuals at selected locations within the wilderness. Although some evidence of human activity already exists in the wilderness (e.g., trails, litter), three requisite attributes of wilderness experience (all except natural integrity) would be diminished during the life of the project at some specific locations in the wilderness. The effects would occur during the mine construction and operations and diminish as mine activity decreases.

Noise from future mining and exploration could be audible at certain wilderness locations near the facilities. Noise levels would be between 20 and 40 decibels, slightly above existing noise levels, based on data collected for the NWM (a whisper is about 30 decibels). The zone of audibility within the wilderness would not be extensive (less than 1 mile from the mine area). Noise levels would be greater during construction (diminishing as you proceed into the Wilderness), but would be temporary, and would cease at the project's completion.

There may be slight effects on air quality (fine particulates) due to increased dust and emissions. The increase probably

would not be measurable at most locations. The increase would not affect the natural integrity or apparent naturalness of the Wilderness Areas. Changes in air quality would be short term, and cease at the end of operations.

If a mine would operate on a 24-hour basis, light and glare at the mill and work camp would be visible from some wilderness locations. Lighting would affect nighttime recreational activities, such as camping or stargazing in localized areas near mine facilities. Lighting can be designed to minimize off-site effects. Lighting effects would occur during the life of the mine and cease at the end of operations.

Roads and mine facilities might displace recreational users of the Wilderness, particularly those seeking solitude and primitive recreation, because of the mine-related traffic and noise. Effects on solitude and primitive recreation would be short term and cease at the end of the reclamation phase. Any increase in traffic that resulted from the improved access would reduce the opportunity for solitude in the wilderness.

The increased human population associated with mining and the familiarity that project workers would have with the recreational opportunity near the mine area are likely to increase recreational use in the wilderness. The extent and magnitude of change in recreational patterns in the wilderness are uncertain and difficult to quantify. Increased recreation use would be greatest during operations, and diminish at the end of operations as mine workers move to seek other employment. Some people who move to the area because of project-related employment might remain in the area. The long-term effect on recreation and opportunities for solitude in the area also is uncertain and difficult to quantify.

Lands immediately adjacent to wilderness remain open to mineral entry. If mineral development occurs closer to the wilderness boundary, effects, particularly noise and lighting, could be magnified.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under this scenario, 17,820 acres of federal land and 2,420 acres of private land remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Forecast for Mineral Activity, (Table 3-2), assumes there is a 2% probability of an underground mine and the potential for up to 5 exploration operations. The area of likely mineral development is shown on Map 2-2.

The NWM Agreement reduces the risk of potential adverse effects due to mining as the highest mineral potential area is no longer available for mining. The risk of adverse effects to wilderness including noise, artificial lighting, water quality impairment, and increasing use are decreased. Lands immediately adjacent to wilderness remain available for mineral entry. If mineral development occurs closer to the wilderness boundary, effects, particularly noise and lighting, could be magnified. If a major mine would be developed on these lands, effects could be similar to those described for Scenario A-1.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under this scenario, 17,760 acres of federal lands would be immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims remain available for mineral development. The Forecast for Mineral Activity, (Table 3-2) assumes the New World Project is a reasonably foreseeable action. In addition, there is a 10% probability of a surface mine and a 2% probability of another underground mine. Up to 7 mineral exploration operations may occur. Area of likely mineral development is depicted on Map 2-3.

Most of the roadless areas adjacent to the Wilderness would be included in the withdrawal, eliminating the risk associated with mining-related development on federal lands next to the Wilderness. Development is likely in the central portion of the study area on private land and existing unpatented mining claims. Effects of development on private land and unpatented mining claims is considered under Scenario A-1 above. While the mineral withdrawal affords protection to lands adjacent to wilderness, development that could occur in the central part of the study area could effect wilderness values and primitive recreation opportunities.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under this scenario, 17,760 acres of unclaimed federal land would be immediately subject to the mineral withdrawal and up to 1,740 acres of Crown Butte's private minerals and 4,180 acres unpatented mining claims would be withdrawn when the NWM Agreement is implemented. Sixty acres of unpatented mining claims and 2,420 acres of private land remain available for mineral development. The Forecast for Mineral Activity, (Table 3-2) assumes no mines would be developed and 1 exploration operation is possible. Area of likely mineral development is depicted on Map 2-4.

The mineral withdrawal combined with the NWM Agreement would essentially preclude any major mine development. This scenario would protect the existing wilderness character and primitive recreation opportunities from potential mining-related changes. This option presents the least risk of potential conflict due to mining-related noise, artificial lighting, air quality, increasing local population, and water quality concerns.

Conclusion

Under Scenario A-1, federal lands immediately adjacent to the wilderness remain available for mineral entry. Noise and artificial lighting from a mine would affect wilderness experiences and solitude. In general, effects are most noticeable near the wilderness boundary and diminish deeper into the wilderness. Increased population associated with mining could lead to increased localized use, however, other visitors may be displaced due to industrial activity in the area. Potential mining development in the drainages of the Upper Stillwater and Clarks Fork Rivers poses a risk to future wilderness water quality.

Under Scenario A-2, the potential for effects to wilderness would be reduced, since the highest mineral development potential area is no longer available for mining. However, if development occurs on lands adjacent to the wilderness, effects could be similar to those described for Scenario A-1.

Under Scenario B-1, roadless areas would be withdrawn, maintaining an area of undeveloped land next to the Wilderness. While this reduces the risk of potential adverse effects to wilderness, mining development likely to occur in the central portion of the study area would result in effects similar to those described for Scenario A-1.

Implementation of the NWM Agreement combined with implementation of the mineral withdrawal (Scenario B-2) significantly reduce the potential for major mine development. This Scenario presents the least potential for mining-related conflict due to noise, artificial lighting, water quality impairment, and the increasing populations in the local area.

Inventoried Roadless Areas

Introduction

Inventoried roadless areas refer to a National Forest area which 1) is larger than 5,000 acres or, if smaller than 5,000

acres, is contiguous to a designated wilderness; 2) contains no developed road, though there may be primitive 2-track motorized trails; and (3) has been inventoried by the Forest Service for possible inclusion in the wilderness preservation system. Within the study area, there are four inventoried roadless areas covering 12,960 acres of federal lands. The roadless areas are the Beartooth, North Absaroka, Republic Mountain, and Reef. Refer to Map 3-9 for the location of the inventoried roadless areas.

Forest Service policy has directed Forest Supervisors to address the roadless area issue in the Forest planning process. Each Forest was to determine through the Forest Plan process whether or not a Roadless Area would be recommended for Wilderness. The Gallatin Forest Plan recommended 480 acres of the Republic Mountain Area for wilderness designation. The remaining roadless areas were not recommended for wilderness, nor were any of the roadless areas in any recent Montana wilderness bills (e.g. H.R. 2799 or H.R. 2473). Those areas not recommended for Wilderness would be managed by the standards and guidelines for the Forest and the management area in which the roadless area lies.

The Forest Service established six objective criteria it considers in evaluating effects on roadless areas. These include natural integrity, apparent naturalness, remoteness, solitude, special features, and manageability and boundaries. These criteria will serve as a basis for evaluating effects to roadless areas that may occur with the alternatives under consideration in this analysis.

Affected Environment

Beartooth Roadless Area

The Beartooth Roadless Area is generally located east of Fisher Creek and the Clarks Fork River. Located in the Gallatin NF and Custer NF and contiguous to the Absaroka-Beartooth Wilderness, the area includes approximately 6,320 acres. The Kersey Lake portion of the area has a low mineral development potential while the remaining area has a moderate potential for mineral development. Approximately nine patented or private mining claims and four unpatented mining claims are within the area. Five lakes lie within the roadless area. The largest, 110-acre Kersey Lake, offers good trout fishing.

The Beartooth Roadless Area is currently affected in several ways by man-made features. The Goose Lake Road (about 5 miles long) bisects the roadless area. The road provides motorized access for four-wheel drive and off-highway vehicles (4x4/OHV) to area lakes. In the winter, the roadless area receives heavy snowmobile traffic. This

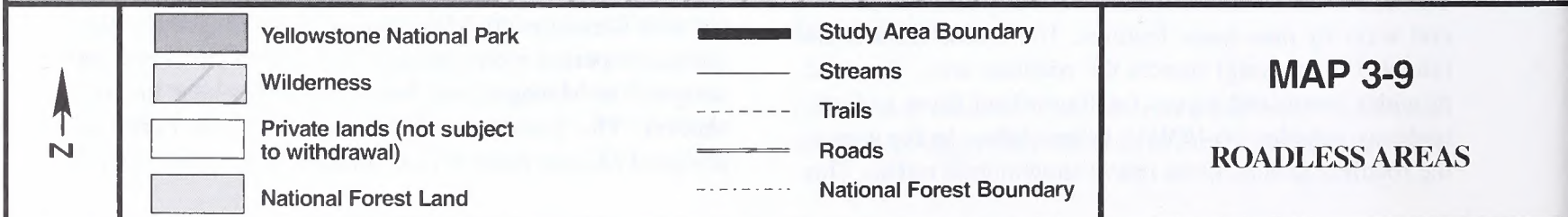
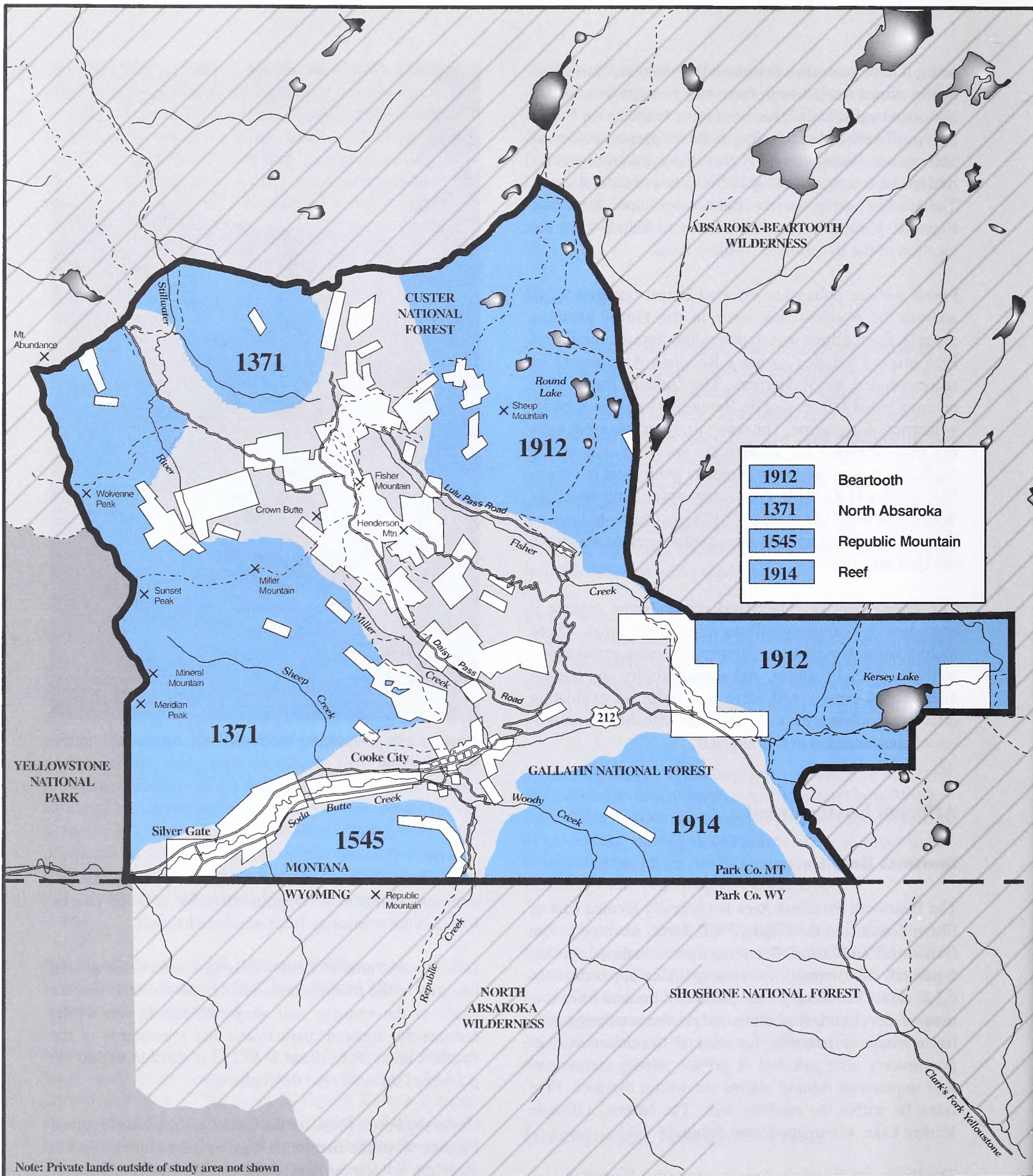


Round Lake, Beartooth Roadless Area, northeast portion of study area.

road affects the area's natural integrity, apparent naturalness and remoteness. Opportunities for solitude can be found in the area away from motorized access.

Development around Kersey Lake also affects the natural integrity of the roadless area. Motorized 4x4/OHV use on roads in the summer and snowmobiling in the winter reduces the apparent naturalness and remoteness of the roadless area. Noise from U.S. 212 is audible within the portion of the area near the highway.

Under the Forest Plans for the Custer and Gallatin National Forests, all of the Beartooth Roadless Area is managed to meet non-wilderness land management objectives. Most of the area is assigned to Management Area 15 (grizzly bear habitat/dispersed recreation/grazing) with a small portion assigned to Management Area 13 (grizzly bear habitat/timber). The portion on the Custer National Forest is assigned Management Area C, grizzly bear emphasis.



North Absaroka Roadless Area

Located on the perimeter of the Absaroka-Beartooth Wilderness Area, the area is composed of 12 separate units, of which two units, Mineral Mountain on the Gallatin NF, and Mount Abundance on the Custer NF, are within the study area. The roadless area covers 3,640 acres of federal land. Two patented and 20 unpatented mining claims are located in the area. The Mineral Mountain Area, adjacent to Yellowstone NP, encompasses the Sheep Creek drainage north of Cooke City and Silver Gate. The Mount Abundance area consists of two parcels at the headwaters of the Stillwater River.

The units show evidence of past mining activity in places, but natural integrity is unimpaired in most of the areas. The northern half of the Mt. Abundance unit has moderate mineral development potential. The rest of that unit and all of the Mineral Mountain unit has a high mineral development potential. Opportunities for solitude within the unit are fair because of the nearby towns, adjacent resource activity, and limited size. Motorized use such as snowmobiling is heavy due to the proximity of the unit to Cooke City. The unit has more motorized (primarily snowmobiling) use than nonmotorized use.

Under the Forest Plans, the North Absaroka Roadless Area is managed to meet non-wilderness land management objectives. On the Gallatin NF, the area is assigned to Management Area 15 (grizzly bear habitat/dispersed recreation/grazing). The portion on the Custer NF is assigned Management Area C, grizzly bear emphasis.

Reef Roadless Area

The Reef Roadless Area consists of 2,300 acres located southeast of Cooke City and south of U.S. 212. Located on the Gallatin NF, the area is contiguous to the North Absaroka Wilderness in the Shoshone National Forest to the south. About 100 acres of private land are in the Reef Roadless Area. This inholding is an old, inactive, patented mining claim, where evidence of old placer mining and an access road may be found. The area has high mineral potential except for a small area with moderate potential. The natural integrity, remoteness, and opportunities for solitude are limited in the northern part of the Reef Roadless Area because of U.S. 212. Away from U.S. 212, the roadless area has a high degree of natural integrity.

Under the Gallatin NF, all of the Reef Roadless Area is managed to meet non-wilderness land management objectives. The area is assigned to Management Area 15 (grizzly bear habitat/dispersed recreation/grazing) and to Management Area 13 (grizzly bear habitat/timber).

Republic Mountain Roadless Area

This 700 acre roadless area includes the north slope of Republic Mountain. The 10,179 foot mountain dominates the area visually. Rugged terrain, including talus slides, deep ravines, and spur ridges typify the approaches to the mountain. Gentler topography prevails near the highway to the north and on the east side of the area along Republic Creek. This fringe contains most of the area's tree cover.

The area is just southwest of Cooke City, Montana, and is well accessed by Highway 212 on the north and by the Irma Mine jeep road on the east. Natural integrity of the area is affected by old mine workings in a few places, generally in the form of exploration pits, drill holes, and the like. Generally, impacts from previous mining are confined to the flatter areas along the north and east boundaries of the area and do not extend to the steeper slopes. Approximately five patented and two unpatented mining claims are located within the area. The entire area is rated high potential for locatable minerals. The entire area is classified for Situation 1 management of the grizzly bear, providing critical habitat for the bear.

The Gallatin NF Plan allocated the area to Management Area 4, recommended wilderness, and to Management Area 15 (grizzly bear habitat/dispersed recreation).

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under this scenario, all 22,000 acres of federal land in the study area remains open to mineral entry, and up to 4,160 acres of private land is available for mineral development. The Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes the New World Project is a reasonably foreseeable action. In addition, there is a 10% probability of a surface mine and a 2% probability of another underground mine. Up to 10 mineral exploration operations may occur. The area of most likely mineral development is shown on Map 2-1.

Under the No Action Alternative, roadless areas remain open to mineral entry. The effects on the four roadless areas depends upon the location and extent of future mineral development. The area of highest mineral potential is located in a roaded setting in the interior of the study area. The Republic Mountain, North Absaroka, and Reef Roadless Areas all have high mineral potential. Most of the Beartooth

Roadless Area has moderate to low mineral development potential.

Without a mineral withdrawal, filing of new mining claims in the roadless areas may occur. Future exploration and development is possible. Such development would affect the natural integrity, remoteness, apparent naturalness, opportunities for solitude, and manageability of the roadless areas in the study area. Mining outside of roadless areas can affect roadless area values such as solitude and remoteness. For example, noise and lighting associated with a mine could be heard or seen from surrounding roadless areas.

Mine facilities, exploration, and access roads could reduce the natural integrity and apparent naturalness of roadless areas. Exploration could occur in roadless areas with high mineral potential. At the end of operations, facilities would be reclaimed and effects on natural integrity and apparent naturalness within the roadless would diminish. However, due to the high elevation, harsh climates and soil types, reclamation of portions of the study area is anticipated to be difficult.

A mining proposal would reduce the sense of remoteness in the roadless area. Sounds from a mine would be audible in much of the roadless areas. Heavy truck traffic would increase noise levels on local roads and in the area adjacent to U.S. 212. Truck traffic and noise would occur for the duration of the project, and cease at the end of the reclamation phase.

New roads and mine facilities might displace recreational users in the roadless areas, particularly those seeking solitude and primitive recreation, because of the mine-related traffic and noise. Effects on solitude and primitive recreation would be short term and cease at the end of the reclamation phase. Any increase in traffic that resulted from the improved access would reduce the opportunity for solitude in the area.

The increased population associated with a mine and the familiarity that project workers would have of the recreational opportunities near the mine area probably would increase recreational use in the area. The extent and magnitude of change in recreational patterns in the roadless areas are uncertain and difficult to quantify. Increased recreation would be greatest during operations, and diminish at the end of operations as mine workers move to seek other employment. Some people who move to the area because of project-related employment might remain in the area. The long-term effect on recreation and opportunities for solitude in the area also is uncertain and difficult to quantify.

Filing of mining claims and subsequent exploration and development of the claims may reduce the size of the

roadless areas. The formerly proposed New World Project serves as an example of how development affects the size and manageability of roadless areas. Depending upon the alternative selected, the range of direct effects on the Beartooth Roadless Area from the NWM are from no acres affected under 4 alternatives up to 89 acres affected under the Modified Proposal. In terms of manageability and boundaries, the development affects a larger area. The effects on manageability and boundaries of the Beartooth Roadless Area range from no effect up to a 1,750 acre reduction in the roadless area if the Modified Proposal is selected. With reclamation, the physical effects of all facilities except the tailings impoundments and access road would be less noticeable over time. Any permanent impoundments would have long-term effects on roadless areas.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under this scenario, 17,820 acres of federal land and 2,420 acres of private land remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Forecast for Mineral Activity, (Table 3-2), assumes there is a 2% probability of an underground mine and the potential for up to 5 exploration operations. The area of likely mineral development is shown on Map 2-2.

Without a mineral withdrawal, filing of new mining claims in the roadless areas may occur. Future exploration and development is possible. The effects on the four roadless areas depends upon the location and extent of future mineral development. The Republic Mountain, North Absaroka, and Reef Roadless Areas all have high mineral potential. Most of the Beartooth Roadless Area has moderate to low mineral development potential.

Mining-related development would affect the natural integrity, remoteness, apparent naturalness, opportunities for solitude, and manageability of the roadless areas in the study area. If a mine is developed, effects could be similar to those described above for Scenario A-1, depending upon the location and size of future mining-related activity.

The NWM Agreement removes the area of highest mineral potential from development. The New World Project would not be developed and additional exploration and development would not occur on 4,180 acres of federal land and up to 1,700 acres of acquired minerals. The NWM Agreement reduces the potential for mining-related effects to roadless areas. Specifically, the potential for mining-related changes

include loss of solitude and the natural integrity of the area. Introduction of mining-related noise, artificial lighting, increased traffic, and increased recreation use as a result of the influx of mine workers would be less likely to occur.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under this scenario, 17,760 acres of federal lands are immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims remain available for mineral development. The Forecast for Mineral Activity, (Table 3-2) assumes the New World Project is a reasonably foreseeable action. In addition, there is a 10% probability of a surface mine and a 2% probability of another underground mine. Up to 7 mineral exploration operations may occur. Area of likely mineral development is depicted on Map 2-3.

The four roadless areas are largely withdrawn from mineral entry. A few unpatented mining claims located within the roadless areas remain available for development. Roadless attributes would not likely change as a result of mining. However, development that is likely to occur on lands still available for mining could affect the solitude and recreation opportunities within roadless areas as for Scenario A-1. The proposed NWP would affect portions of the Beartooth Roadless area.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under this scenario, 17,760 acres of unclaimed federal land are immediately subject to the mineral withdrawal and up to 1,740 acres of Crown Butte's private minerals and 4,180 acres unpatented mining claims are withdrawn when the NWM Agreement is implemented. Sixty acres of unpatented mining claims and 2,420 acres of private land remain available for mineral development. The Forecast for Mineral Activity, (Table 3-2) assumes no mines would be developed and 1 exploration operation is possible. Area of likely mineral development is depicted on Map 2-4.

Mining-related actions would only occur on certain patented lands and 60 acres of remaining unpatented mining claims on the National Forest. As most of the high potential land is no longer available for mining, development of a large scale mine is highly unlikely.

As the four roadless areas are withdrawn from mineral entry, the existing roadless area attributes and character are

maintained. Roadless area values for recreation and solitude, wildlife habitat, water quality, and scenery would be maintained. In the event the areas are considered for wilderness designation in the future, the roadless areas are not encumbered with additional mining claims.

With no major mines developed in the central portion of the study area, the solitude and character of the roadless areas are maintained. Intrusion of mining-related noise, artificial lighting, and increased traffic and use are less likely to occur. The Goose and Kersey Lake Roads would remain open and continue to provide motorized 4x4/OHV access through the roadless areas. These roads would continue to reduce the natural integrity, and apparent naturalness of the area. Other activities, particularly motorized recreation, affecting attributes of remoteness and solitude would continue to increase. The attributes of the roadless areas could be affected by the proposed cleanup of historical mine disturbances. The effect would be short term and cease at the end of the cleanup activities.

Conclusion

Mining anticipated under Scenario A-1 poses the greatest potential for change to roadless area attributes. Reef, Republic Mtn, and North Absaroka inventoried roadless area have high mineral development potential and they remain open to mineral entry. Future development would affect the natural integrity, remoteness, opportunities for solitude, and manageability of roadless areas.

The potential for increased noise, artificial lighting, increased traffic, and increased recreation use is reduced due to implementation of the NWM Agreement (Scenario A-2). However, roadless areas remain available for mineral entry, and roadless area attributes could change as a result of future mineral exploration and development.

Under Scenario B-1, withdrawn land includes most of the four roadless areas. Mining-related development would not directly threaten roadless area attributes. Development likely to occur in the central portion of the study area would affect roadless area recreation opportunities due to the introduction of noise, artificial lighting, increased traffic, and increased recreation use.

The combined effects of the a mineral withdrawal and the NWM Agreement (Scenario B-2) results in the least potential for adverse effects to roadless area attributes. The existing solitude and character of roadless areas is maintained although increasing non-mine related recreation use is anticipated.

Wild and Scenic Rivers

Affected Environment

The Wild and Scenic Rivers Act affords protection to two types of rivers, designated Wild or Scenic Rivers and Study Rivers. A designated river segment is a river segment that has been designated by the U.S. Congress or the Secretary of the Interior as a wild, scenic, or recreational river. Study rivers are segments that were identified through the Act for study for their suitability for inclusion in the Wild and Scenic River System. No study rivers are in the project area.

The purpose of this section is to disclose the effects on designated Wild and Scenic Rivers. The analysis also discloses effects on segments considered eligible for inclusion into the Wild and Scenic River System. An eligible river segment is a river or creek that has been determined by a land-managing agency to be free-flowing and possess at least one outstandingly remarkable value. Land-managing agencies, such as the Forest Service or National Park Service, have developed policies to protect the values associated with river segments eligible for inclusion into the Wild and Scenic River System.

The analysis considered the four characteristics of Wild and Scenic Rivers (U.S. Department of the Interior, and U.S. Department of Agriculture, 1982):

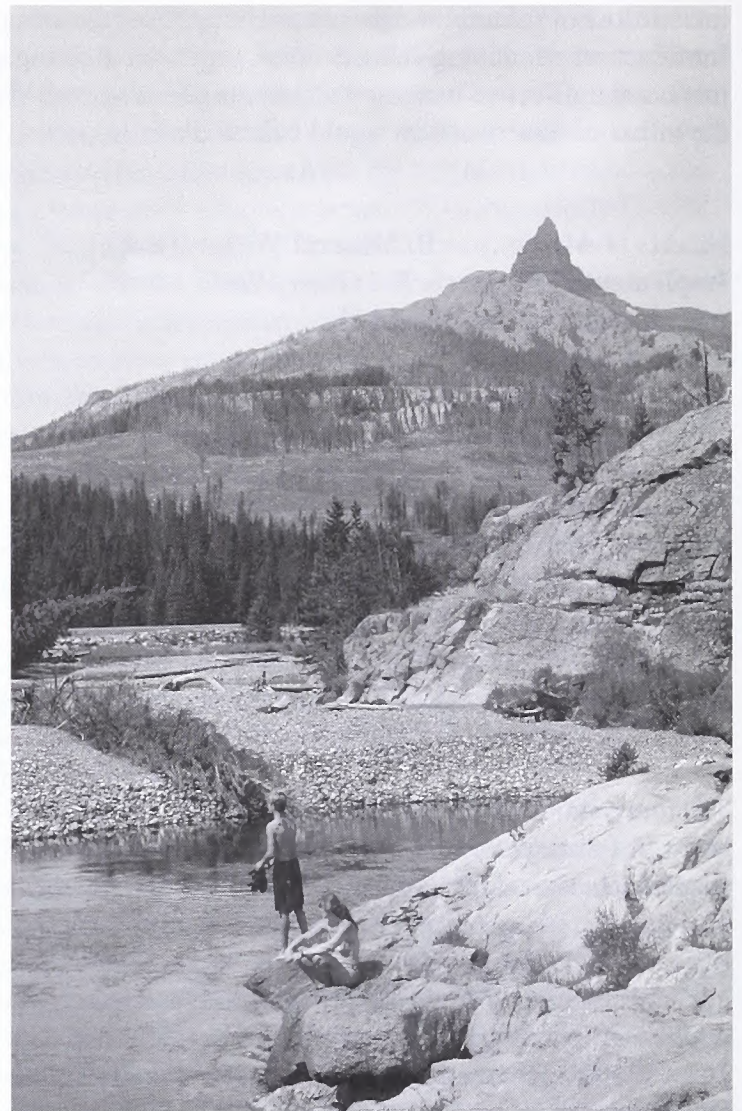
- free of impoundments;
- generally inaccessible except by trails;
- watersheds or shoreline essentially primitive; and
- waters unpolluted

The Wild and Scenic Rivers Act also describes six outstandingly remarkable values that Wild and Scenic Rivers may possess: scenic, recreational, geologic, fish and wildlife, historical, and cultural. This analysis of Wild and Scenic Rivers considers only those outstandingly remarkable values for which a river segment is designated or considered eligible.

Designated and eligible river segments in and adjacent to the study area are shown on Map 3-10.

Designated Wild River

The designated segment of the Clarks Fork Yellowstone River starts about 17 miles downstream from the Montana/Wyoming border. It has three outstandingly remarkable values: scenic, recreational, and historic (Shoshone National Forest, 1979). The scenic values are the deep canyon and associated rapids, waterfalls and cascades. The recreational values are viewing scenery and enjoying unique and



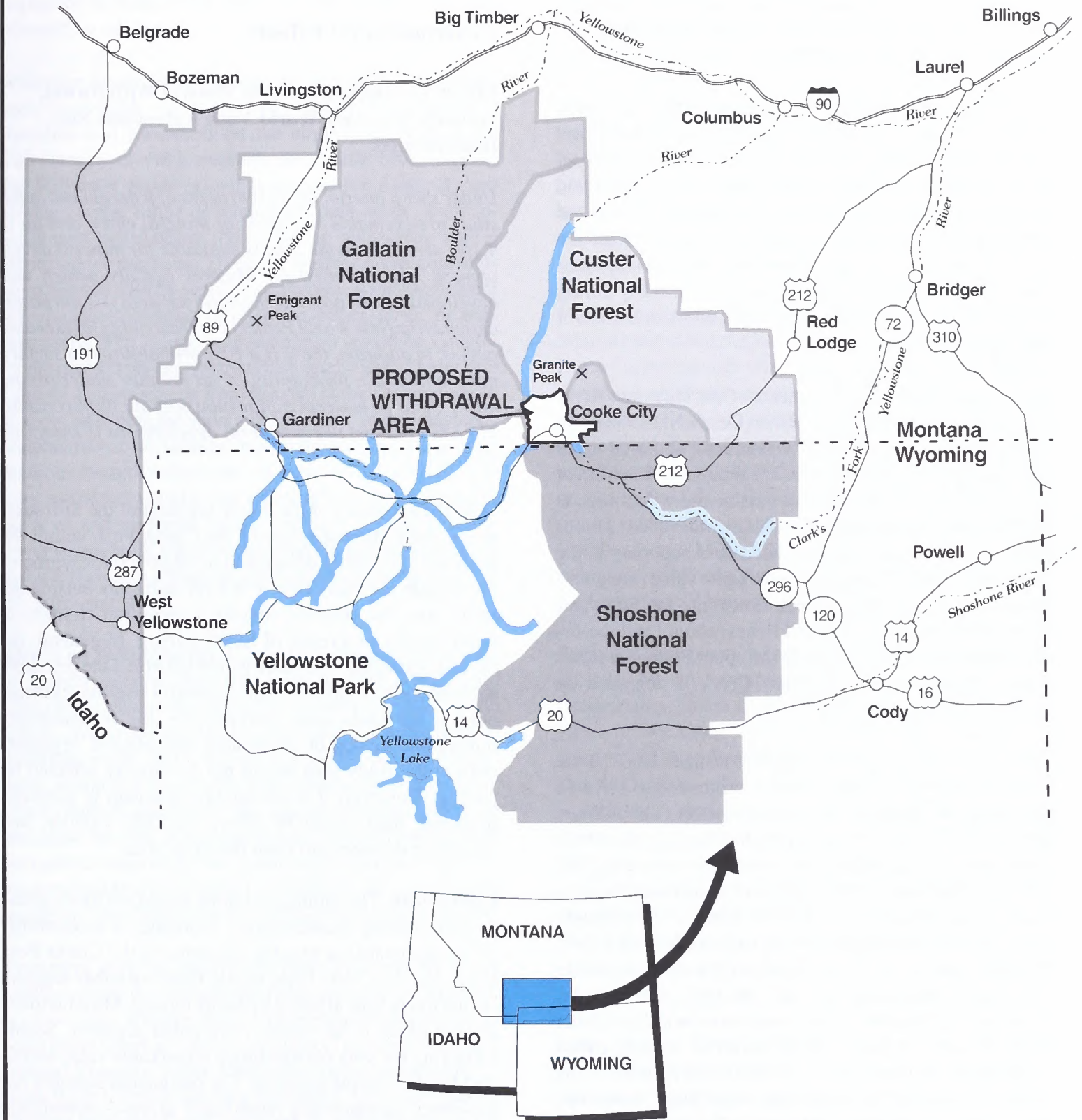
Clark's Fork of the Yellowstone River, with Pilot Peak in the background.

unusual environments, such as waterforms, narrow canyon walls, and wind-blown vegetation. Traditional water-based recreation is limited by rugged access and steep gradients. The historic value is the historical use by Chief Joseph and the Nez Perce Indians in 1877 (Shoshone National Forest, 1979). The 20.5-mile-long designated corridor is 1/2-mile wide (1/4-mile from each bank). Although the designated segment provides good habitat for Yellowstone cutthroat trout, it is not considered exceptionally high quality fish habitat.

Eligible River Segments

Several eligible wild, scenic or recreational river segments are within or adjacent to the study area. Eligible river segments include:

- a 1.8 mile segment of the Clarks Fork River within the study area, just north of the Montana/Wyoming State line. The outstandingly remarkable value is scenery;



- Designated
- Eligible

MAP 3-10
WILD AND SCENIC RIVERS
IN VICINITY

- 2.0 miles of the Stillwater River within the study area and approximately 25 miles downstream from the study area including about 20 miles in the A-B Wilderness. The outstandingly remarkable values are recreation and scenic;
- Soda Butte Creek inside Yellowstone NP. Outstandingly remarkable values include scenic, wildlife, historic and geologic values.

The Gallatin NF identified 1.8 miles of the Clarks Fork as an eligible river. The eligible segment is mostly within the A-B Wilderness with the exception of a short segment within the study area between the wilderness boundary and the Clark Fork trailhead bridge. Fisher Creek, which has been degraded by historical mine discharges, forms the Clarks Fork after its confluence with Lady-of-the-Lake Creek. Elevated metal concentrations, particularly during high flows, are found in the upper Clarks Fork as a result of the upgradient mine discharges.

The Custer NF identified segments of the Stillwater River as an eligible Wild and Scenic River (Custer NF, 1986). The river segment within the A-B Wilderness, about 20 miles long, is eligible as a Wild River. The remaining 7.5 miles of river within the Custer NF, but outside the wilderness, is eligible as a Recreational River. This includes about 2 miles of the river upstream from the wilderness boundary in the study area. The outstandingly remarkable values are recreational and scenic. Daisy Creek flows into the Stillwater River, which enters the A-B Wilderness about 1 mile below the confluence. Water quality in the upper Stillwater River below its confluence with Daisy Creek is degraded by historical mine discharges.

The National Park Service (NPS) considers Soda Butte Creek in the Park to be eligible for designation as a Scenic River under the Wild and Scenic Rivers Act (Yellowstone NP, 1990). The headwaters of Soda Butte Creek, which enters the Park near Silver Gate, are in the study area. The NPS described the eligible segment of Soda Butte Creek as having outstanding scenic, wildlife, historic and geologic values. Seven miles inside the Park it passes through Icebox Canyon, a narrow and steep walled cut that receives so little sun that ice remains on the walls into June each summer. Three miles above the creek's confluence with the Lamar River, it passes a large, active travertine mound, called 'Soda Butte.' It is one of very few thermal features in the northeast corner of the Park. The 'Soda Butte' was a late 19th-century landmark on the road to Cooke City, where a historic soldier station, gamekeeper's cabin, and saloon were located in the floodplain of the creek (Yellowstone NP, 1990).

Fisheries and recreational values in Soda Butte Creek have been affected for the past 50 years by poor water quality

from the McLaren tailings and other historical mining activities. The McLaren tailings are in the upper part of the watershed, east of Cooke City. Below its confluence with Soda Butte Creek, the NPS considers the Lamar River eligible as a Scenic River.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented.

Under this scenario, all 22,000 acres of federal land in the study area remains available for mineral entry, and up to 4,160 acres of private land is available for mineral development. The Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes, assumes the New World Project is a reasonably foreseeable action. In addition, there is a 10% probability of a surface mine and a 2% probability of another underground mine. Up to 10 mineral exploration operations may occur. The area of most likely mineral development is shown on Map 2-1.

With the exception of the 2 mile segment of the Stillwater River and a short segment of the Clarks Fork within the study area, the other designated or eligible river segments are outside the study area. For river segments outside the study area, the primary concern is potential changes to water quality as a result of future mining. In general, the mining within the study area would not affect the primitive shoreline or accessibility of designated or eligible segments outside the study area. Furthermore, the outstandingly remarkable values of designated and eligible segments outside the study area would not be directly affected by mining. However, if water quality upstream is seriously impaired, there could be effects on fish, wildlife, and recreation downstream from the study area.

Clarks Fork. The mining activities would not likely affect the free flowing characteristics, shoreline, or accessibility of the designated or eligible segments of the Clarks Fork River. For the Clarks Fork, scenic values of either segment are not likely to be affected by future mining. Mine facilities are not likely to be visible from either segment. Scenic values are the only outstandingly remarkable value identified for the eligible segment. The designated segment has two other outstandingly remarkable values—recreational and historical. Recreational use of area resources would increase. Some of the increase might occur within the designated segment. The magnitude of this change in use is very difficult to predict or quantify. Mining would not affect historical value (historical use by the Nez Perce Indians).

Soda Butte Creek. Future mining would not affect the shoreline or accessibility of the eligible segments of Soda Butte Creek. The eligible segment of Soda Butte Creek is in Yellowstone NP, west of Cooke City. Future mining could effect water quality in Soda Butte Creek as described below. Outstandingly remarkable values of the eligible segments of Soda Butte Creek would not be adversely affected by mining.

Stillwater River. Future mining could affect the outstandingly remarkable values and the primitive character of the shoreline and watershed for the eligible segment of the Stillwater River within the study area. As the headwaters of the Stillwater River remain available for filing of new mining claims, future development could occur. Such development could effect the recreation and scenic values identified for this river. Three alternatives under consideration for the NWM would not comply with the current visual quality objective of retention, either during or after operations. The tailings impoundments would be visually inconsistent with the surrounding landscape. The scenic value of the area as seen from this part of the corridor would be reduced in both the short and long term. In the long term, reclamation of the tailings impoundments and other mine facilities would reduce the adverse visual effects. The impoundments would not be visible from other segments of the river, and the scenic values would not be affected in the lower segments of the drainage. The change in streamflow and water quality would not affect the recreational value of the Stillwater River.

Effects on Water Quality. Mineral development in the area of highest mineral potential, including the NWP could affect water quality in Fisher, Miller, and upper Soda Butte Creeks. Water quality effects could consist of an increase in sediment, metal, TDS, nitrate, and sulfate. Mine development would not likely affect the eligibility of the Upper Clarks Fork, Soda Butte Creek, and the Stillwater River for inclusion into the Wild and Scenic Rivers System. With mitigation required by the water rights compact between the State of Montana and the United States, flows and water quality in Soda Butte Creek would not appreciably change.

Treatment may be required to meet Montana B1 water quality standards, and non-degradation at the NPS boundary to comply with the water rights compact (no change in Soda Butte Creek at the Park boundary) and Outstandingly Natural Resource water designation (non-degradation) of Soda Butte Creek at the Park boundary. Any water quality changes in Fisher Creek could affect water quality in the Wild River segment of the Clarks Fork River although the change would be highly diluted and subject to non-degradation requirements in Montana and Wyoming.

Because changes to ground-water quality from mine workings is impossible to predict with certainty, mining compa-

nies would need to monitor water quality and discharge of springs and seeps. If mine-related spring discharge does not comply with surface water quality standards, a water treatment program would need to be implemented for as long as necessary to meet standards and protect water quality.

Streamflows. Future mining could reduce 100 year low flows in Miller Creek and upper Soda Butte Creek. For the New World Project, 100 year low flow depletion for Soda Butte Creek at the Yellowstone NP boundary would be less than 1%. Streamflow would need to be augmented to Soda Butte Creek to offset any reductions at the Yellowstone NP boundary. To accomplish this, mining companies would have to obtain water rights with current consumptive use, retire the water use, and make the water available to the Soda Butte Creek drainage.

The mining activities would not likely cause any additional mine related effects on water quality or streamflow in Soda Butte Creek beyond that which has been occurring for decades from historical mine activity near Cooke City. The McLaren tailings and other sources of metals near Cooke City would remain in the upper part of the Soda Butte watershed, and would continue to seasonally affect water quality in Soda Butte Creek in Yellowstone NP. Reclamation of existing mining disturbances in upper Miller Creek could improve Miller Creek water quality with a slight reduction in Soda Butte Creek metal loadings at the Yellowstone NP boundary.

Projected changes in the streamflow and water quality for the New World Project would not be measurable in the designated segment of the Clarks Fork Wild and Scenic River in Wyoming. The addition of a new underground mine would raise the potential for measurable water quality and streamflow effects which would be constrained by water quality and non-degradation standards. Mine construction could alter the timing of streamflows in the designated or eligible segments of the Clarks Fork River with lower (about 0.5 cfs) winter flows and slightly higher peak flows. Several New World Project alternatives would increase concentrations of total dissolved solids, hardness, sulfate, nitrate, and ammonia but the increase would still comply with water quality standards. In the New World Project alternatives, collection and treatment of the Glengarry adit discharge would decrease metal concentrations in the eligible Clarks Fork segment. All mines in this alternative would also temporarily increase sediment discharge by up to 5% in the designated section of the Clarks Fork River which would gradually reduce to pre-mining levels as disturbed areas stabilize and revegetate and mining areas are reclaimed.

Cleanup of the historical mine disturbances in Fisher Creek, including removing and treating of adit waters, and reclama-

mation of abandoned roads, drill pads, and tailings, would improve the water quality of the mining area by removing acid mine drainage. Cleanup of Fisher Creek would eventually increase pH and reduce the concentrations of metals, sulfate, suspended sediment, and dissolved solids. This would result in a slight improvement in water quality of the Clarks Fork River in the designated Wild River section. Cleanup of the McLaren pit and associated mine drainage would substantially improve water quality in Daisy Creek with moderate improvement to the water quality in the eligible section of the Stillwater River.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under this scenario, 17,820 acres of federal land and 2,420 acres of private land remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Forecast for Mineral Activity, assumes there is a 2% probability of an underground mine and the potential for up to five exploration operations. The area of likely mineral development is shown on Map 2-2.

Risks to water quality impairment of designated and eligible Wild and Scenic rivers is reduced due to the NWM Agreement. The NWP as well as other potential development would not occur in acquired lands which include the area of highest mineral potential. If a mine were developed, effects could be similar to those described above for Scenario A-1, depending upon the location and size of the mine.

The 17,820 acres of federal land that remains available for mineral entry includes the eligible portions of the Stillwater River and Clarks Fork within the study area. Future mining could affect the outstandingly remarkable values and the primitive character of the shoreline and watershed for the eligible segment of the Stillwater River and Clarks Fork within the study area. Such development could effect the recreation or scenic values identified for these rivers.

Most of the cumulative effects would occur from past mineral activities and future projects. Past mining activities have altered water quality in Soda Butte Creek in Yellowstone NP, the Clarks Fork, and eligible sections of the Stillwater River. Water chemistry and sediment reduction improvements associated with reclamation of existing mining disturbances would be expected to result in minor water quality improvements in the Clarks Fork and Soda Butte Creek and moderate water quality improvement in the upper Stillwater River. Reconstruction of Highway 212

from the northeast entrance of Yellowstone NP to the Montana/Wyoming border would pose cumulative temporary minor sediment increases to Soda Butte Creek in Yellowstone NP and the Clarks Fork River. These sediment increases (less than 5%), would be similar to sediment levels which have occurred with the numerous highway reconstruction projects in Yellowstone NP and the Clarks Fork River in the Shoshone National Forest. The other reasonably foreseeable activities identified in Chapter 2 would not be expected to result in cumulative water effects.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under this scenario, 17,760 acres of federal lands are immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims remain available for mineral development. The Forecast for Mineral Activity, assumes the New World Project is a reasonably foreseeable action (Table 3-2). In addition, there is a 10% probability of a surface mine and a 2% probability of an another underground mine. Up to seven mineral exploration operations may occur. Area of likely mineral development is depicted on Map 2-3.

Withdrawing federal lands would reduce the potential for streamflow or water quality changes to designated or eligible Wild and Scenic Rivers. However, the area of highest mineral potential in the central portion of the study area would remain available for development. Development of the NWP as well as other possible mines would lead to effects similar to those described for Scenario A-1 above.

The outstandingly remarkable values and the essentially primitive shoreline of the Stillwater and Clarks Fork River within the study area are less likely to change as a result of the withdrawal. Lands adjacent to the eligible segments would be withdrawn from mineral entry.

This Scenario would reduce the availability of adjacent federal land for NWP facility sites, and require facility development on private land and on existing, unpatented mining claims. This could result in more environmentally impactful locations for some of the NWP facilities, and increase the risk of adverse water quality impacts to Yellowstone NP and the Clarks Fork River compared to Scenario A-1.

Recreational use of area resources would increase. Some of the increases might occur within the eligible segment, such as fishing in Soda Butte Creek or the Lamar River. The magnitude of this change is very difficult to predict or quantify.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented.

Under this scenario, 17,760 acres of unclaimed federal land are immediately subject to the mineral withdrawal and up to 1740 acres of Crown Butte's private minerals and 4,180 acres unpatented mining claims are withdrawn when the NWM Agreement is implemented. Sixty acres of unpatented mining claims and 2,420 acres of private land remain available for mineral development. The Forecast for Mineral Activity, assumes no mines would be developed and one exploration operation is possible (Table 3-2). Area of likely mineral development is depicted on Map 2-4.

The risk of changes to streamflows and water quality from future mining to designated and eligible river segments would be significantly reduced due to the combined effects of the mineral withdrawal and the NWM Agreement. Only 60 acres of federal land and 2,200 acres of private land remain available for mining, and no mines are forecasted. The outstandingly remarkable values of rivers within the study area would not be affected by mining.

Past mining activities have altered water quality in Soda Butte Creek in Yellowstone NP, the Clarks Fork, and eligible sections of the Stillwater River. Water chemistry and sediment reduction improvements associated with reclamation of existing mining disturbances would be expected to result in minor water quality improvements in the Clarks Fork and Soda Butte Creek and moderate water quality improvement in the upper Stillwater River. Reconstruction of Highway 212 from the northeast entrance of Yellowstone NP to the Montana/Wyoming border would pose cumulative temporary minor sediment increases to Soda Butte Creek in Yellowstone NP and the Clarks Fork River. These sediment increases (less than 5%), would be similar to sediment levels which have occurred with the numerous highway reconstruction projects in Yellowstone NP and the Clarks Fork River in the Shoshone National Forest. The other reasonably foreseeable activities identified in Chapter 2 would not be expected to result in cumulative water quality effects.

The anticipated cleanup of historic mine-related disturbances in the headwaters of the Clarks Fork would be designed to improve water quality. The improvement would be more pronounced in the eligible segment. It is not known whether aquatic life standards would be achieved in the eligible segment of the Clarks Fork River. If cleanup does not achieve aquatic life standards, fishing would remain impaired.

The McLaren tailings and other historical mine disturbances in Soda Butte Creek would continue to degrade

water quality and aquatic life in Soda Butte Creek in the Park. Very high sediment loads in the eligible segment also would continue to adversely affect recreational and fish and wildlife values. Discharges from the McLaren Pit in the Daisy Creek drainage would continue to have similar effects on water and aquatic life resources of the upper Stillwater River. Recreational fishing in these two segments would remain impaired. Cleanup of historical mine-related disturbances in the Daisy Creek watershed would eventually improve water quality in the Stillwater River. It is not known whether aquatic life standards would be achieved in the upper segment of the Stillwater River below the confluence with Daisy Creek. If cleanup does not achieve aquatic life standards, fishing would remain impaired. Outstandingly Remarkable Values would be protected.

Conclusion

Mineral development anticipated under Scenario A-1 would not likely affect the eligibility of the three rivers with the exception of the Stillwater River in the study area. Mining development in upper Stillwater could effect recreation and scenic values. Free-flowing character and outstandingly remarkable values for the other eligible segments are not likely to be affected by future mine development. There is a risk to water quality of the eligible segments if mitigation measures are not effective or if a facility such as a tailings impoundment fails. Mining could slightly alter streamflows in the eligible and wild river segments.

Implementation of the NWM Agreement (Scenario A-2) significantly reduces the probability of a major mine being developed in the area. Therefore, the risks of impaired water quality or reduced flows is lessened. If a mine were developed on available federal land (17,760 acres) or on the remaining private land, effects could be similar to those described for Scenario A-1.

The mineral withdrawal would affect 17,760 acres of federal land including the eligible portions of the Clarks Fork and Stillwater Rivers within the study area. Potential mining-related effects to their shorelines and the outstandingly remarkable values are less likely to occur. Mineral development that could occur in the central portion of the study area on private land and unpatented mining claims poses a risk to water quality and quantity of eligible and wild river segments as described above under Scenario A-1.

Scenario B-2 presents the least risk of changes in streamflows and water quality in designated and eligible wild and scenic rivers due to low probability of any major mine in the future.

Air Quality

Affected Environment

Climate

The study area is characterized by long cold winters, short cool summers, and deep snow conditions throughout much of the year. Mean frost-free period is short, about 30 days between mid-July and mid-August. Average annual precipitation is 60 inches in the higher elevations, and 27 inches in the valley bottom at Cooke City. Mean annual snowfall in the area ranges from 300 to 500 inches. Precipitation is maximum in January, and minimum in August. Summer thunderstorms are common.

Air Quality

Air quality in the study area is excellent. Yellowstone NP and the North Absaroka Wilderness area to the south were designated as Class I PSD areas under the Prevention of Significant Deterioration (PSD) program when the Clean Air Act was amended in August 1977. The A-B Wilderness, which was established in March 1978 (after the Clean Air Act was amended), is a Class II area.

Prevailing wind direction is from the southwest, although individual storm fronts can have prevailing north or south wind directions. Up valley and down valley wind patterns develop during summer. Wind dispersion throughout the study area is robust although localized inversions can develop over Cooke City and Silvergate. The PM-10 data which Crown Butte collected during 1989-1991 (NWP PDEIS, Appendix F) includes arithmetic and maximum PM-10 in micrograms per cubic meter (ug/m³) at the McLaren mine (13 and 35 ug/m³), Fisher Creek (8 and 25 ug/m³), and Cooke City (19 and 83 ug/m³). These PM-10 values were well below the ambient standards of 150 ug/m³ (24hr) and 50 ug/m³ (annual). Projected air quality effects are based on Appendix F of the NWP PDEIS (Preliminary Determination of Crown Butte's Air Quality Permit Application), and are all well within National Ambient Air Quality Standards.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented.

Under this scenario, all 22,000 acres of federal land in the study area remains available for mineral entry, and up to 4,160 acres of private land is available for mineral development. The Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes,

assumes the New World Project is a reasonably foreseeable action (Table 3-2). In addition, there is a 10% probability of a surface mine and a 2% probability of an another underground mine. Up to 10 mineral exploration operations may occur. The area of most likely mineral development is shown on Map 2-1.

Potential air quality mining effects in the study area are due to emissions from engines and heating equipment, and dust from roads, tailings, and disturbed areas around mine facilities. Projected air quality mining effects of the New World Project are summarized in Appendix F of the NWP PDEIS, Preliminary Determination of Crown Butte's Air Quality Permit Application. Assuming the New World mine and underground mine are not simultaneously in operation, emissions associated with surface and underground diesel exhaust, waste oil burning, and mine air heating could produce approximately the estimated emissions for the New World mine which are 49 t/y of nitrogen oxide, 23 t/y of sulfur dioxide, 20 t/y of carbon monoxide, and 14 t/y of hydrocarbons. Particulate emissions would increase slightly due to increased road dust and wind erosion of tailings material. Gaseous emissions from the open pit mine would not be expected to exceed the New World mine concentrations as neither mine would fall into PSD requirements since they would be under the 250 t/y emissions threshold that characterizes a "major stationary source". The NWP PDEIS, Appendix F projected maximum 24 hr ug/m³ PM-10 increases for the New World mine would be about 55 in the mine area, 0.12 in Cooke City, 0.07 in Yellowstone NP, and 0.46 in the Absaroka Beartooth wilderness. Annual average PM-10 increase is projected to be 1.84 ug/m³ in the mine area, 0.13 in the Absaroka Beartooth wilderness, and 0 in Cooke City and Yellowstone NP. All projected PM10 increases are well within compliance with National Ambient Air Quality Standards. The open pit mine would be expected to have similar nitrogen oxide, sulfur dioxide, and hydrocarbon emissions but much greater potential particulate and PM-10 emissions due to exposure of soil and tailings to high wind velocity. The open pit mine could substantially increase PM-10 levels in the mine area with a moderate increase in downwind portions of the Absaroka Beartooth Wilderness. Road, facility, and tailings dust mitigation would be required by the Montana Air Quality Division as part of the air quality permit, and would include watering, vegetative stabilization, and/or chemical stabilization of road surfaces. Visibility impacts would be well within contrast threshold limits set by EPA.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under this scenario, 17,820 acres of federal land and 2,420 acres of private land remain available for mineral entry.

Interests acquired under the NWM Agreement including up to 1740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Forecast for Mineral Activity, assumes there is a 2% probability of an underground mine and the potential for up to five exploration operations (Table 3-2). The area of likely mineral development is shown on Map 2-2.

Air quality effects of Scenario A-2 would be similar but less in magnitude to the effects described for Scenario A-1 since the New World mine would not be developed. Cumulative effects from historic emission activities in the study area would not occur. This alternative would include effects listed above plus future emissions. Reasonably foreseeable activities identified in Chapter 2 would not be expected to result in cumulative air quality effects except for increased vehicle and wood burning smoke emissions associated with additional domestic and recreational developments in the Cooke City and Silvergate areas. Temporary increases in diesel exhaust and particulates would occur during reconstruction of Highway 212.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under this scenario, 17,760 acres of federal lands are immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims remain available for mineral development. The Forecast for Mineral Activity, assumes the New World Project is a reasonably foreseeable action (Table 3-2). In addition, there is a 10% probability of a surface mine and a 2% probability of an another underground mine. Up to 7 mineral exploration operations may occur. Area of likely mineral development is depicted on Map 2-3.

Air quality effects for scenario B-1 are similar to Scenario A-1 previously described, due to anticipated development of the NWP. The area of highest mineral potential remains available for mineral development. The 17,760 acres immediately subject to the withdrawal consists of lands immediately adjacent to Yellowstone NP and the wilderness. Mining-related disturbances that could result in degradation of air quality would not occur on these lands.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented.

Under this scenario, 17,760 acres of unclaimed federal land are immediately subject to the mineral withdrawal and up to 1740 acres of Crown Butte's private minerals and 4,180 acres unpatented mining claims are withdrawn when the NWM Agreement is implemented. Sixty acres of unpat-

ented mining claims and 2,420 acres of private land remain available for mineral development. The Forecast for Mineral Activity, assumes no mines would be developed and one exploration operation is possible. Area of likely mineral development is depicted on Map 2-4

Scenario B-2 has the best potential for air quality protection in that it would result in only minor amounts of mineral exploration but no foreseeable mine on federal lands. Air quality would have only minor and localized project related emissions from diesel drill rig exhaust and road dust. Visibility would not be affected.

Reasonably foreseeable activities identified in Appendix B would not be expected to result in cumulative air quality effects except for increased vehicle and wood burning smoke emissions associated with additional domestic and recreational developments in the Cooke City and Silvergate areas. Temporary increases in diesel exhaust and particulates would occur during reconstruction of Highway 212. The likely withdrawal effect of no new open pit mine would eliminate the large potential increase in particulates in the mine area and the moderate increase in the downwind portions of the A-B Wilderness.

Conclusion

Air quality within the study area is excellent with very limited emission sources and robust wind dispersion. Mining within the study area has relatively minor potential for gaseous or particulate emissions and limited probability for ambient air quality standard violations or adverse impacts to the Class I Yellowstone NP or the North Absaroka Wilderness. Any development of open pit mines in the north end of the study area has potential to increase dust and particulate impacts to the adjacent Class II A-B Wilderness.

LAND USE

Introduction

Issues considered in this section include:

- Effect of the withdrawal on the availability of minerals;
- Effect of the withdrawal on mineral development potential of private land and existing unpatented mining claims;
- Effect of the withdrawal on the New World Project;

- Consistency with Forest Land and Resource Management Plans.

The current land uses, the geology of the study area, and the reclamation potential also are discussed in this section.

Current Land Uses in Study Area

Recreation. A wide variety of year-round recreational activities occur on federal lands in or near the study area. The proximity to Yellowstone NP and the A-B Wilderness provides opportunities for wilderness recreational experiences near the study area. The study area is used during the summer for camping, mountain biking and four-wheel driving, in the fall for hunting, and in the winter for snowmobiling and cross-country skiing.

Timber and Grazing. Before the 1988 Storm Creek forest fire, timber harvesting was limited in the study area because of grizzly bear habitat requirements. From 1988 to 1993, timber harvesting increased in response to salvageable timber damaged by the 1988 Storm Creek fire. Recently, only occasional small-scale timber harvesting has occurred in the mine area. No livestock grazing occurs in the study area.

Mining. The mineral potential of the New World District was recognized as early as 1869. Since then, companies have mined copper, gold, silver, lead, and zinc sporadically in several locations. Crown Butte has conducted mineral exploration and development activities in the mine area over the past 8 years. The area's mining history is discussed in greater detail in Cultural Resources.

Subdivision/Residential development. The 1990 Census reported that there were 277 housing units in the Cooke City/Silver Gate area. About 22 percent of the homes are occupied on a year-round basis while the remainder serve as part time recreational homes. Since 1990 on average, three or four new residences or cabins are constructed per year (Park County Planning Office).

County land use regulations do not include any zoning for Cooke City/Silver Gate. Park County, Montana, is developing a comprehensive plan, which will include the entire county except Cooke City/Silver Gate. In the Cooke City/Silver Gate area, federally managed land is exempt from zoning regulations.

Geological Resources

Affected Environment

Most of the study area is classified as having high occurrence potential for one or more types of precious and/or base metal mineral deposits. The entire study area has varying degrees of development potential (Table 3-2, Forecast for Mineral Activity). The mineral deposits are associated with Cretaceous and Eocene age (38-141 million years ago) igneous intrusions that originated at depth and moved upward through the earth's crust before cooling near the surface. Precious and base metal deposits on public domain federal land in the study area are currently administered as locatable minerals under the General Mining Law of 1872 (1872 Mining Law). Private minerals coming into the public domain as a result of the August 12, 1996, Agreement may be administered under the Acquired Lands Leasing Act of 1947.

General Geology

The Beartooth Mountains are a Laramide basement-cored range typical of the Rocky Mountain Foreland (Kulik and Schmidt, 1988). The uplift is a northwest-trending, fault-bounded block, about 75 miles long and 25-40 miles wide (Simons, et al, 1979). Highly resistant Precambrian metamorphic rocks have been uplifted as much as 15,000-20,000 feet against Phanerozoic sedimentary rocks. The mountains rise as much as 5,000 feet above the surrounding land surface.

The proposed withdrawal study area is situated along the juncture of the Beartooth Plateau and Cooke City structural zone. The Beartooth Plateau consists predominantly of Precambrian granite gneiss and unmetamorphosed granite, dated at about 2.7 billion years. The Cooke City zone forms the western limit of the Beartooth Plateau. It is a structural low that trends northwest-southeast. Several Tertiary intrusive centers are aligned along this zone; it may have been a major control on emplacement of Eocene intrusive centers and related mineralization. Within this zone, Paleozoic sedimentary rocks have been preserved; the Precambrian-Cambrian contact dips southwest. Much of the western portion of the zone is covered with Tertiary volcanics (USGS, 1993).

Strata in the area strike generally northwest-southeast, and have southerly to southwesterly dips. Faults and fractures in the area have predominant orientations of northeast, north-northwest, and east-west. Mineralization often occurs along these fractures (Lovering, 1929).

Several intrusive stocks were emplaced during Eocene time. The stocks are interpreted to be the cores of stratovolcanos and consist of felsic calc-alkaline rocks. They are present as stocks, sills, dikes, laccoliths, and other irregularly-shaped bodies. Volcanics associated with the stocks are mainly found in the southwestern portion of the study area.

The land surface has experienced alpine glaciation during the Pleistocene, resulting in the formation of cirques, hanging valleys, glacial lakes and morainal deposits. There has been considerable Holocene deposition, as stream alluvium, talus, and landslide deposits.

Mineral Demand

Gold, copper, and silver are the commodities that are of interest to the mining industry in the Cooke City area at the present time. Other metals may be of interest in the future (Appendix B).

Gold is produced and used on a world-wide basis. Domestic mines continued to produce at near record levels, maintaining the United States' position as the world's second largest gold-producing nation. The importance of gold as a store of wealth, including its role in world monetary systems, is the principal driving force that leads to efforts to find and produce more gold.

Of the total gold available in the world today about one-third is held by national central banks and other official agencies such as the World Bank and the International Monetary Fund as a support for monetary systems. Another third is held in private hoards, as a hedge against inflation and sudden domestic or international instabilities, or for speculation purposes. The other third is in jewelry and in other fabricated uses such as in the electronic industry and dentistry (USGS, 1988).

Since 1980, U.S. consumption of refined copper has ranged from 1.8 to 2.4 million tons. Worldwide consumption reached 10.8 million metric tons in 1991. Electrical uses are the dominant domestic use. Other copper uses are in construction, machinery, and transportation.

Silver is produced by about 120 mines in 18 states. Total domestic mine production in 1994 was an estimated 1,400 tons. World silver production was an estimated 14,000 tons. Photography continued to be the largest single use of fabricated silver, accounting for just over 50 percent of the total demand. Electronics and batteries comprised about another 20 percent. Jewelry, silverware, coins, and miscellaneous other uses account for the remaining demand (U.S. Bureau of Mines, 1995).

Economic Geology

Mineral deposit types in the proposed withdrawal area fall into five distinct categories:

- skarn-replacement
- porphyry copper-molybdenum-gold
- alkaline gabbro-syenite association (magmatic segregation)
- polymetallic veins
- gold placers

Skarn-replacement deposits are produced when mineralizing fluids expelled from igneous intrusions penetrate into limestone, chemically altering the carbonate. Skarns form crescent-shaped zones around the Fisher Mountain and Homestake intrusive complexes (Elliott, et al 1992). Much of the mineralization has occurred within the Meagher limestone. At Fisher Mountain, fractures associated with faulting, permitted migration of fluids to the overlying Pilgrim Limestone. Within the Homestake and Alice E. breccias, carbonate fragments served as hosts for the mineralizing fluids (Elliott, 1992).

Hydrothermal alteration of the limestone is most intense at distances up to 150 feet from its contact with the intrusive. Within this range, the Meagher Formation has been massively replaced by sulfides and iron oxides. Beyond this distance, the replacement zone is thinner, and metal concentrations decrease (Elliott, et al, 1992). At 600 feet from the contact, the limestone is only slightly altered.

The Fisher Mountain and Homestake intrusive complexes are both weakly mineralized copper-molybdenum-gold porphyries. To the north, the Upper Cretaceous Goose Lake stock is also a weakly mineralized copper porphyry. It includes syenite porphyry as well as monzonite, quartz monzonite and intrusive breccia. Copper-gold-platinum group element (PGE) mineralization is interpreted to be a magmatic segregation deposit associated with secondary potassium feldspar near the center of the Goose Lake stock (USGS, 1993).

Few secondary enriched or oxidized zones related to the porphyries have been identified. It is interpreted that much of this epithermal mineralization was removed by glaciation and subsequent erosion.

Mineralized veins may be found as much as 5 kilometers (3 miles) from an intrusive center, independent of host rock (USGS, 1993). Veins more proximal to the intrusions may be enriched in gold-copper minerals, whereas distal veins are probably enriched in lead and zinc. South of Cooke City, lead-zinc-silver mineralization occurs in polymetallic veins as replacement in Cambrian limestones. Mineralization

here is about a mile from the nearest stock. Mineral development potential is identified in Map 3-11.

Historical Activity

The mineral potential of the area was recognized in 1869, with the first prospectors arriving soon thereafter. Initially, mining occurred in the Republic Mountain area south of Cooke City, along the Montana-Wyoming state line. During the period 1875-1887, small amounts of lead, silver and zinc were produced. The mines continued to operate until the early 1950s.

Between 1888 and 1930, copper-gold ore was mined north of Cooke City, at the Little Daisy, Homestake, Glengarry, and Alice E. mines. The McLaren Gold (open pit) mine commenced operation in 1933, and closed in 1953 when its mill burned. The mine produced a reported 337,000 tons of ore; average grade was 0.184 ounces per ton (opt) gold, 0.26 opt silver and 0.59% copper (Elliott, et al, 1992). Map 3-16, Cultural Resources, identifies the major mines and prospects in the Cooke City area.

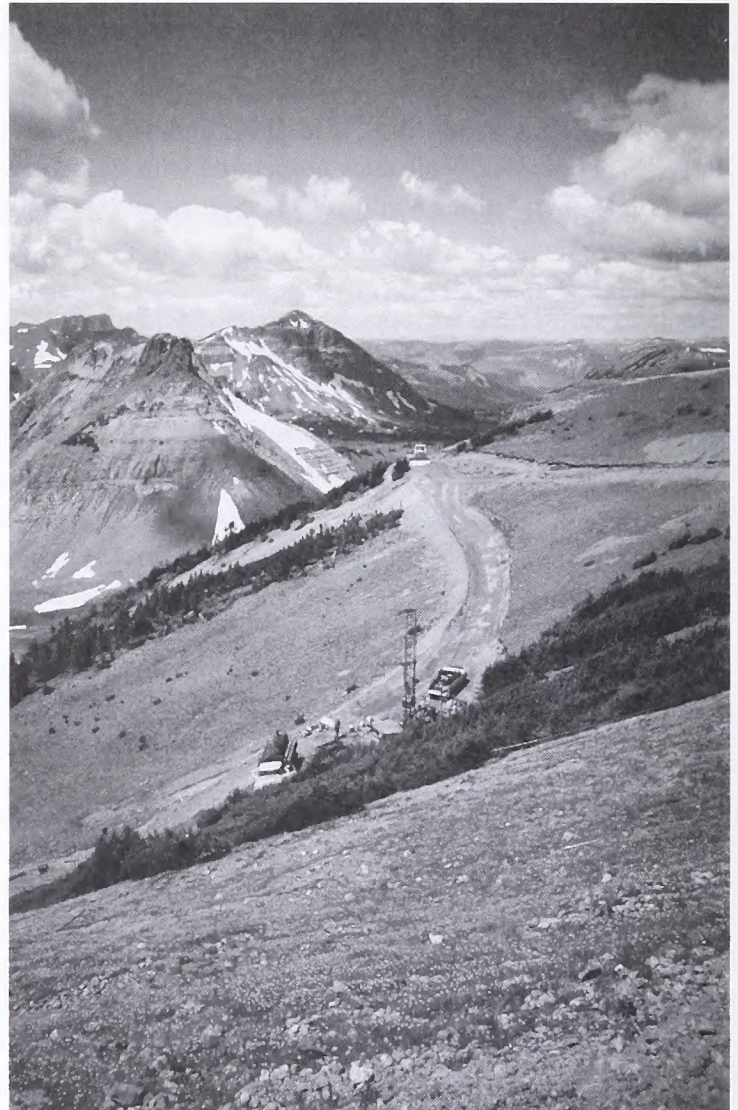
The upper Stillwater River and Soda Butte Creek have known gold placers. Three placer claims were patented in 1892.

Mining of a copper-rich syenite occurred during the period 1904-07 at the Copper King mine, north of Goose Lake, and just north of the study area. Copper ore was stockpiled, but none shipped. The deposit contains porphyry copper, gold, and PGE.

By the time mining ceased in the late 1950's, over 3,300 acres of claims had been patented. Overall, New World district production to date is a reported 62,311 ounces of gold; 692,386 ounces of silver; 1,963,800 pounds of copper; 3,242,615 pounds of lead; and 920,200 pounds of zinc. Most of the gold and copper came from the McLaren Gold mine (Elliott, 1992; Reed, 1950).

Recent Activity

Exploration resumed in the 1960's, concentrating on the potential for porphyry copper-molybdenum deposits. North of Goose Lake, Bear Creek Mining Company discovered mostly low-grade copper porphyry. During 1962-73 and during the early 1980's in the Fisher Mountain area, several companies identified gold-copper-silver deposits in the Como area. Crown Butte Mines, Inc. explored the Henderson Mountain area beginning in 1987 and discovered several high-grade gold-copper skarn and replacement deposits, including the Miller Creek deposit, the Homestake intrusion breccia, as well as additional surface and subsurface minable deposits at McLaren. Total core drilling by Crown

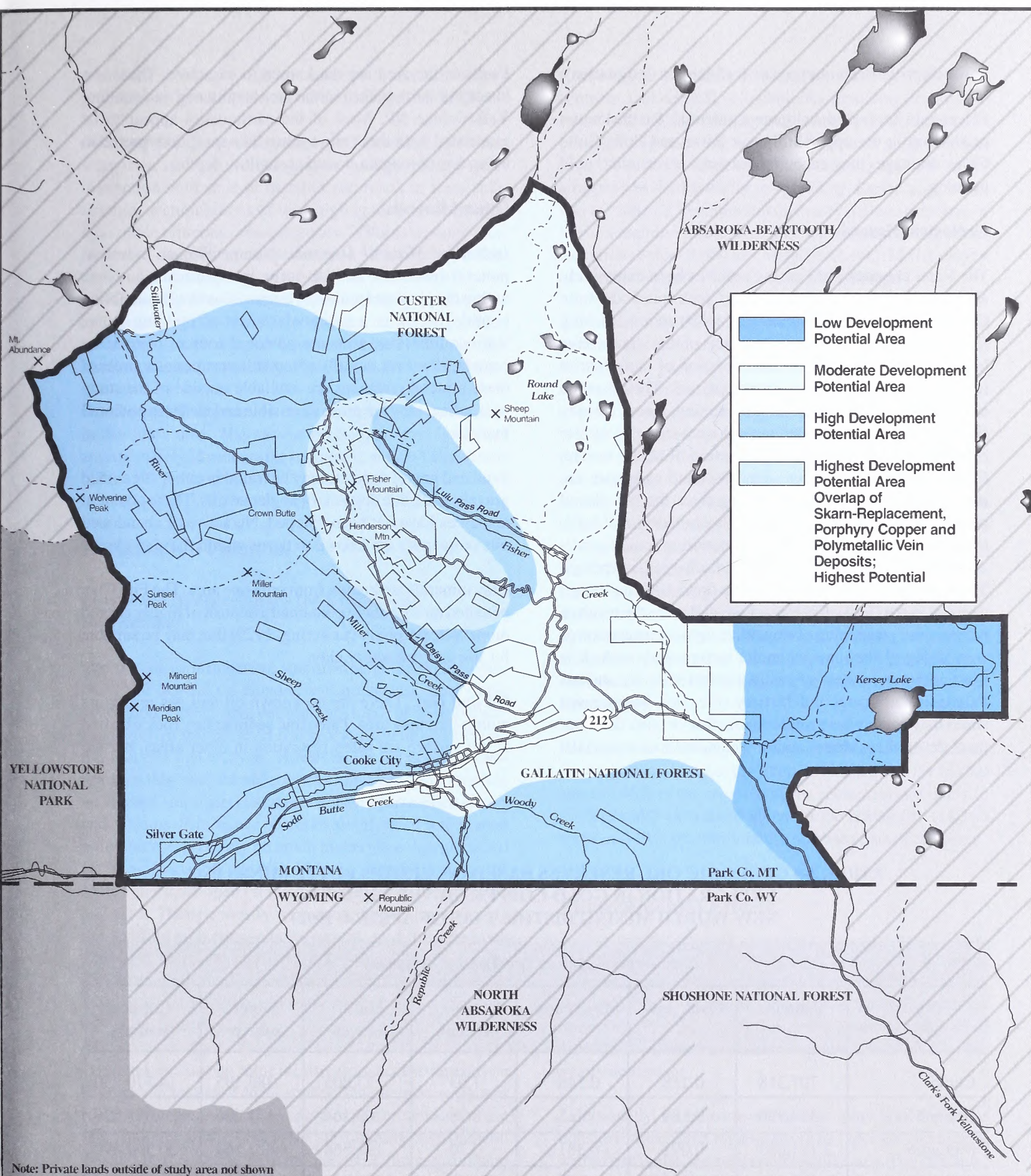






Mineral exploration, core drilling, near Henderson Mountain.

Butte between 1987 and 1992 is 295,375 feet in 824 holes (Elliott, et al, 1992). Total metal content is estimated at 2.6 million ounces of gold, 179 million pounds of copper, and 10 million ounces of silver, in over 12 million tons of ore reserves (Table 3-9 Ore Reserves).

Currently, 265 unpatented lode mining claims are being maintained in the study area. Most are in the area that includes Henderson Mountain and Scotch Bonnet Mountain. It is estimated that the total area of lode claims is about 3,900 acres. Three placer claims encompassing perhaps 65 acres appear to be associated with the intrusions around Henderson Mountain.

There are two lode claims (about 40 acres) in the Republic Mountain area. They are located in proximity to the Irma mines, where lead-zinc-silver mineralization was exploited. Portions of seven lode claims located along the south shore of Goose Lake extend into the withdrawal area. These segments total about 80 acres. The claims are within the A-B Wilderness area, which has already been withdrawn from



	Yellowstone National Park
	Wilderness
	Private lands (not subject to withdrawal)
	National Forest Land

Study Area Boundary
 Streams
 Trails
 Roads
 National Forest Boundary

MAP 3-11

MINERAL DEVELOPMENT POTENTIAL

mineral entry (the claims predated wilderness designation).

Placer gold has little development potential, but the known production in the upper Stillwater River and Soda Butte Creek drainages may encourage casual (recreational) gold panning.

Geological Hazards

The water chemistry of Fisher Creek has been extensively altered (and to a lesser extent, Daisy Creek, and Soda Butte Creek) by past acid rock drainage (ARD) and/or leaching from mine tailings. The upper portions of this stream have been severely impacted due to oxidation of chalcopyrite (copper-iron sulfide) in the mineralized rock. Though much of the current ARD is due to past mining, a recent study (Furniss, 1996) documented natural weathering of sulfide minerals that resulted in the production of acidic waters. Furniss identified ferricrete deposits (iron carbonate cementation of stream gravels) dating from the last glacial period, perhaps 8,000 years ago. Precipitation that infiltrates through sulfide-bearing rock or tailings could generate additional sulfuric acid that is discharged at springs. There are numerous mass-movement (landslide and slump) deposits in the Cooke City area. Landslides are the result of natural over-steepening of slopes through stream erosion or weathering of the igneous and/or sedimentary rock. It is most common in areas of easily weathered rocks, such as Paleozoic carbonates and Tertiary volcanics. Man-caused slides may occur where road construction or other development destabilizes slopes and/or weathered rock materials.

Faults in the area are not known to be active. There is a history of earthquakes in the area within and surrounding Yellowstone NP. Most of the earthquakes appear to be associated with the Yellowstone 'hot spot', interpreted to be a zone of magma, found at shallow depths.

Other Minerals

Industrial Mineral Deposits. Nonmetallic or industrial mineral resources do not occur in significant amounts within the proposed withdrawal area. Massive Precambrian granitic gneiss is a potential source of building stone. Various limestone units are potential sources of rock for cement. However, equally acceptable or superior sources of these mineral resources are available outside of the study area, where they are more accessible and closer to potential markets.

Sand and gravel deposits may be found in either streambed gravels, landslide deposits or as glacial tills. These potential resources have not been mapped. No active or abandoned pits or quarries are known to occur within the study area.

Clay minerals are known from only one area. The Fire Clay patented mining claim contained a deposit of highly altered monzonite porphyry (Lovering, 1929) that may be suitable for use as a refractory clay.

Oil and Gas. There are no known oil and gas reservoirs within the study area. Paleozoic sedimentary rock exposed at the surface are often reservoirs in other areas, but are

**TABLE 3-9 GEOLOGIC ORE RESERVES BASED ON CROWN BUTTE MINES INC.
EXPLORATION IN GOLD-COPPER-SILVER DEPOSITS,
NEW WORLD MINING DISTRICT (AS OF APRIL 4, 1992)**

Ore Grade, Ounces Per Ton, or Percent							
Deposit	Tonnage	Gold, opt	Silver, opt	Copper, percent	Gold, ounces	Silver, ounces	Copper, pounds
Como	707,318	0.118	0.546	1.03	77,805	386,195	14,570,750
Fisher Mtn.	334,200	0.189	1.13	0.28	63,164	377,646	1,871,520
McLaren	2,171,035	0.091	0.381	0.70	197,564	827,164	30,394,490
Miller Creek	2,218,368	0.387	1.54	0.87	858,508	3,416,286	38,599,603
Homestake	6,600,966	0.224	0.83	0.71	1,478,616	5,478,801	93,733,717
Total	12,031,887				2,675,657	10,486,092	179,170,080
Average Grade		0.222	0.87	0.75			

presumed to be too shallow, and too fractured to have retained any generated hydrocarbons (Tonnsen, 1982).

Iron and Manganese Bog Deposits. Remobilization and separation of iron and manganese through ground-water interaction with soils or marshes can result in local sedimentary accumulations of very high grade iron or manganese oxide minerals in bog deposits. Within the study area, ferricrete deposits are exposed along Fisher and Miller Creeks, and near springs in the vicinity of the old McLaren pit. These deposits consist of clasts of porphyry, limestone and shale, cemented by a finer-grained matrix of goethite. Historically, such deposits have been mined in Europe, but have not been economically important in the United States.

Geothermal Resources. No hot springs are known to occur in the study area. The closest geothermal area is located approximately 20 miles to the southwest, within Yellowstone NP.

Reclamation Potential

Landscape Interpretations for Erosion and Reclamation

The processes influencing soil erosion potential are complex, and depend on climate, soil properties, land slope, vegetation cover, and degree and kind of disturbance. Prediction of project level soil erosion potential is beyond the scope of this analysis. However, for the northern two-thirds of this area, the severity of climate; shallow, weakly weathered soil materials; steep slopes; sparse plant cover; and extreme disturbance potential all infer that soil erosion potential will probably be much higher than that predicted for most parts of the NF. This is exemplified by the McLaren Pit, an open pit mine dating back to the mid 40's and 50's. Though mostly recontoured now, it previously exemplified high erosion rates; barren, acid soils; bedrock exposure, and steep slopes. The Goose Lake mining district, just north of the study area, also has been heavily affected by past activity and remains a physical and chemical pollution source.

Post- and concurrent- mine reclamation success depends on a number of factors. The most important of these are proper reclamation planning, mine operator performance, and use of techniques appropriate to the surrounding environment. Assuming the former two are adequate, the environment has a strong influence on overall reclamation success. The objectives of reclamation include preventing excessive erosion and returning natural native communities to disturbed lands. In addition to establishing ground cover we should attempt to initiate natural succession in a disturbed area so that native communities develop over time.

Reclamation is considered to be "normal" when the environment is amenable to techniques involving reasonable costs, with high probability of success in reducing erosion potential and restoring a relatively natural plant community. Soils have relatively thick topsoil, and are easily stripped and stockpiled for re-spreading. Landscape indicators of "normal" reclamation difficulty include presence of lower subalpine forest, wet soils with riparian vegetation, elevations below 8,000 feet Mean Sea Level (MSL), clayey or medium textured soils, and moderate slopes.

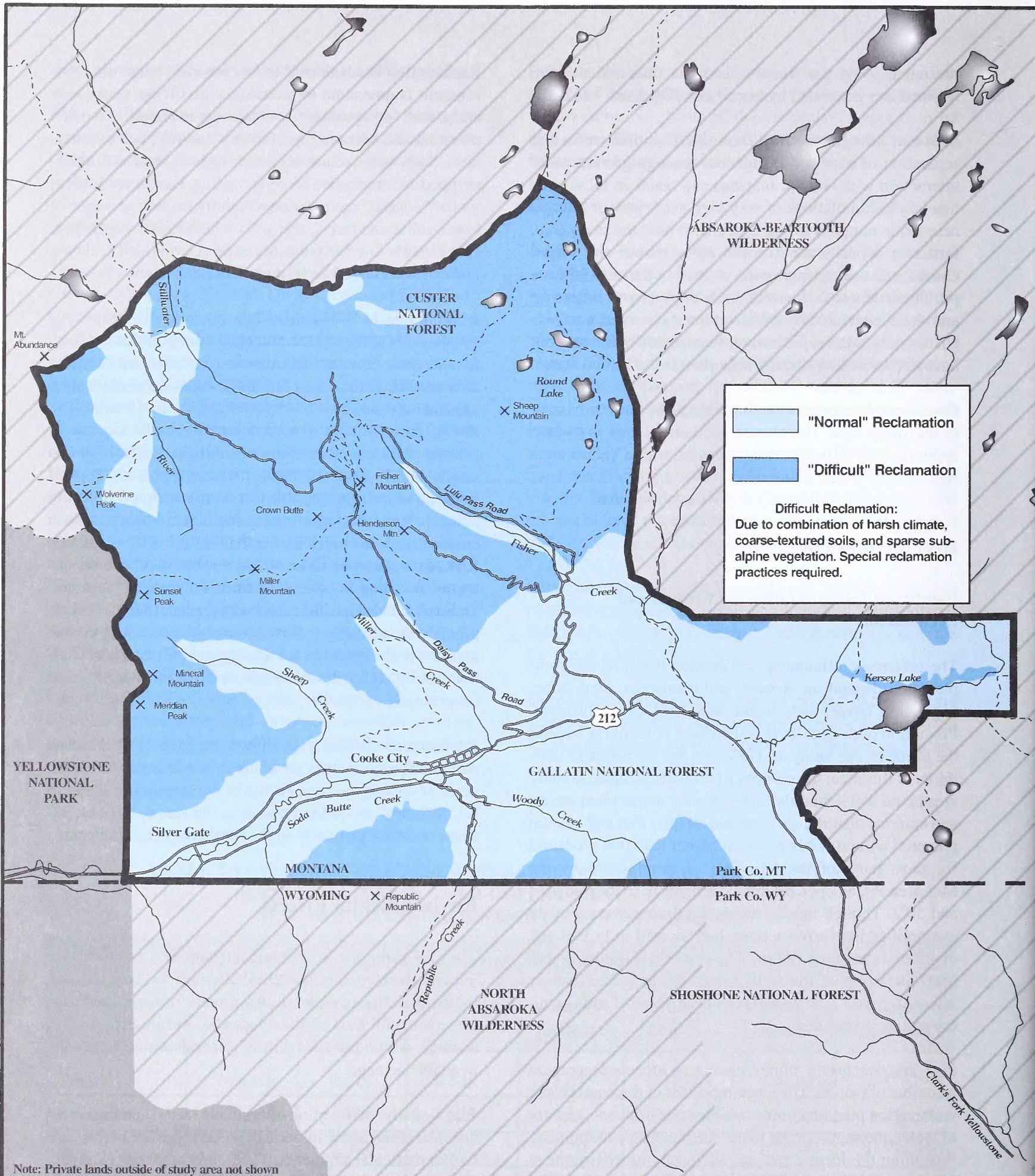
Reclamation is "difficult" when climatic conditions are severe, soils are marginal, and plant communities are fragile and slow growing. Effective reclamation may require area-specific research, or require unusual investment such as plant nurseries on site or specialized seed collection. The rate of ground-cover re-establishment may be too low to prevent erosion on some slopes. Soils have low fertility and may be highly disturbed during the mining process. Topsoil is marginal and is susceptible to mixing with lower, infertile or acidic layers during stripping. Reclamation costs in these environments are much higher than in "normal" situations. Risk of revegetation failure is higher than in other environments, resulting in potential additional costs of "re-reclamation". Landscape indicators are presence of upper subalpine forest and turfs; shallow, coarse or moderately coarse textured soils; potential for acidifying soil materials; shallow, rocky soils; elevations above 8,000 feet MSL.; and steep slopes.

Reclamation difficulty is shown on Map 3-12. Normal reclamation techniques are likely to be adequate for 12,000 acres or 46% of the area. However, reclamation is likely to be "difficult" as defined above in the remainder (14,160 acres or 54%), primarily in the northern part of the area.

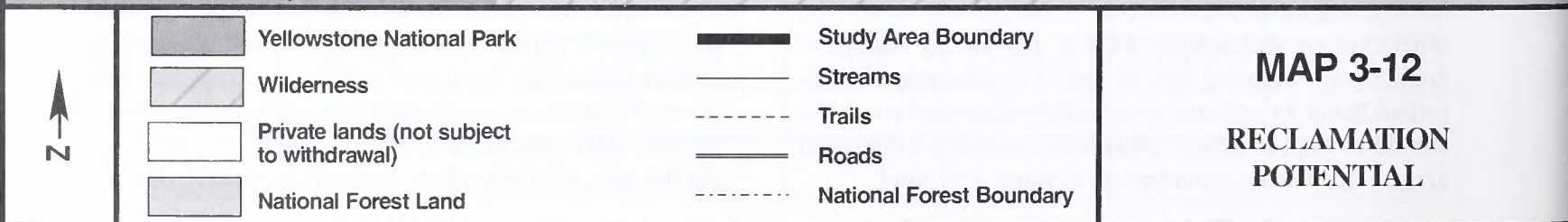
Environmental Effects

The direct impacts to geological resources from hardrock mineral development, under all alternatives, are based on the availability of federal and private mineral lands for mineral exploration and development, and are expressed in acreage. A withdrawal of federal minerals would reduce the available acreage.

Additionally, the location of available lands is an important consideration. Some mineral deposits types are found only within particular segments of the study area. For example, skarn-replacement deposits have the highest known likely development potential. Known deposits are concentrated around Henderson Mountain; permissive areas for undiscovered deposits are restricted to the western two-thirds of the area. Polymetallic vein deposits may be found throughout the area, but have lower economic potential; they may



Note: Private lands outside of study area not shown



contain base metals rather than precious metals, and may be of insufficient tonnage to support a viable mine.

Mineral resources to be affected by the Alternatives and the NWM Agreement have been quantified. Crown Butte's New World Project (NWP) has delineated reserves of precious and base metals in skarn-replacement deposits (Table 3-9). The quantity of undiscovered mineral resources may be estimated by deposit type, using past development and the NWP as analogs (Table 3-10).

Appendix B is a forecast of future mineral activity in the Cooke City area. This forecast has been tailored to the assumptions for each Alternative. The baseline for impact analysis is the quantity and type of mineral resources produced to date in the New World Mining District (NWMD). It was used to determine the amount and degree of change for each Alternative. The baseline for assessing impacts relating to geologic hazards, most notably acid rock drainage, is the present condition. For geologic hazards, this analysis will attempt to qualify the impacts of the Alternatives.

It is assumed that future exploration and/or development would occur on available lands with the highest development potential for each alternative.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

This Scenario assumes continued exploration and development of the entire study area, encompassing 26,160 acres of federal (22,000 ac.) and private (4,160 ac.) minerals. All potential mineral deposit types could be fully explored for their economic development potential. Exploration in some form would be conducted continuously across the area, with more concentrated activity occurring where higher values of mineralization are found. Reconnaissance-scale activity would result in little surface disturbance. More concentrated exploration drilling (as many as 10 separate operations) would each disturb 4 acres over a 2-3 year period.

It is forecast that development would focus on the gold-bearing copper skarns in the Henderson Mountain area. A moderate-sized underground mine, Crown Butte's New World prospect, would be developed. This operation would disturb about 180 acres over its 12-22 year mine life (NWP PDEIS, Chap 3.4). Up to 11 million tons of ore would be produced, yielding 2.3 million oz. of gold, 8.8 million oz. of silver and 132 million pounds of copper.

Crown Butte has also delineated surface-minable resources in the McLaren and Como area. These prospects (or a

similar deposit) are forecast to be developed. It would disturb 200-400 acres over an 8-15 year mine life, and yield as much as 275,000 oz. of gold, 1,213,000 oz. of silver, and 45 million pounds of copper.

Additional exploration could lead to the discovery of a second underground mine prospect. This prospect has not yet been delineated, and thus has a lower probability of development. It is forecast to disturb 75-200 acres over an 8-15 year mine life. Its reserves are forecast to be similar to the New World prospect.

Projected mineral resources developed from any one of the three forecast mines would be orders of magnitude greater than the total gold, silver and copper produced to date in the New World Mining District. Assuming all three mines were developed, the study area would produce approximately 200,000 ounces of gold annually over a 20 year period. To put this in perspective, Montana's largest gold producer, the Zortman-Landusky mine, averages about 100,000 ounces of gold per year.

The amount and degree of change from baseline conditions as a result of mining under this Alternative is significant. Exploration and mining activities would be continuous for the foreseeable future, with the majority of activity occurring on private land. Due to the lead time needed to explore a prospect and obtain approval for its development, none of the three forecast mines, if developed, would be in full production at the same time.

The risks of acid rock drainage caused by exposing hazardous geologic materials, most notably sulfide-bearing rock, could increase substantially. Earthmoving and blasting could increase the potential for landslides and snow avalanches. Mine structures and engineered landforms, such as tailings impoundments and waste rock dumps, run the risk of failure in the steep terrain and alpine climate. Impacts associated with geologic hazards are potentially adverse and significant. Identification of potential hazards would best occur as design alternatives at the mine permitting stage (NWP PDEIS Chap 3.4).

Scenario A-1 represents the maximum development forecast for the study area. This Scenario would have a significant beneficial effect on the long-term mineral productivity of the New World Mining district. Additionally, exploration and development of this geologic terrain in its high alpine environment could lead to important scientific and economic understanding of its geology, as well as development of innovative mineral extraction and reclamation techniques which might be utilized throughout the industry.

TABLE 3-10. EFFECTS OF LOCATABLE MINERALS

MEASUREMENT	Alternative A: No Mineral Withdrawal		Alternative B: Proposed Mineral Withdrawal	
	Scenario A-1 NWM Agreement Not Implemented	Scenario A-2 NWM Agreement Implemented	Scenario B-1 NWM Agreement Not Implemented	Scenario B-2 NWM Agreement Implemented
Mineral Acres Available	26,160	20,240	8,400	2,480
Available Deposit Types with Development Potential	• All	• Skarns • Magmatic Segregation • Polymetallic veins	• Polymetallics • Gold-rich copper skarns • Porphyry copper	• Skarns • Polymetallic veins near Republic Mtn and Goose Lake
Mineral Acres Unavailable	0	5,980	17,760	23,680
Development Forecast				
Mines	2 Underground 1 Surface	1 Underground 0 Surface	2 Underground 1 Surface	No mines
Relative Probability of Development (See Appendix B)	• 1st underground mine: > 1:10 • 2nd underground mine: > 1:50 • Surface mine: 1:10	• Underground mine: < 1:50	• 1st underground mine: 1:10 • 2nd underground mine: < 1:50 • Surface mine: < 1:10	
Exploration Activity	10 Operations	5 Operations	7 Operations	1 Operation
Location of Activity	Mostly private land	Mostly federal land	Mostly private land	Private land
Total Acres Disturbed	495-820	75-200	495-820	4
Potential Ore Production Deposit Types	20 Million tons from gold-rich copper skarn	8 Million tons from skarns/polymetallic veins	20 Million tons from gold-rich copper skarn	0 Tons; exploration of polymetallic veins
Potential Metal Production, New World Mine Project	Au: 2.3 MM oz. Ag: 8.8 MM oz. Cu: 132 MM lb.	No production	Au: 2.3 MM oz. Ag: 8.8 MM oz. Cu: 132 MM lb.	No production
Speculative Metal Production	Au: 2.6 MM oz. Ag: 10.0 MM oz. Cu: 179 MM lb	Au: 2.3 MM oz. Ag: 8.8 MM oz. Cu: 132 MM lb.	Au: 2.6 MM oz. Ag: 10.0 MM oz. Cu: 179 MM lb	No Production

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

If the NWM Agreement is implemented, mineral land available for mining would total 20,240 acres. Crown Butte currently maintains or leases about 4,180 acres of mining claims, and owns or leases 1,740 acres of patented claims. Under the agreement, the federal government would acquire, or otherwise make unavailable for mining, Crown Butte's mineral holdings.

The Agreement would result in a 5,920 acre (23%) decrease in the total land available for mining in the study area. The area with known mineral reserves having the highest development potential (Map 3-11) would be unavailable for mining. Non-Crown Butte patented claims (private land) around Henderson Mountain, though available, might not have sufficient reserves to support mining independent of adjacent federal lands being available for entry. Mining activity would focus on areas of high development potential, located in the western and southwestern portions of the study area. The majority of the activity would occur on federal land.

Reconnaissance-scale exploration is forecast to continue, but at a substantially lower level than without the NWM Agreement. Five exploration drilling programs could each disturb 4 acres and last 2-3 years, a 50% decrease from Scenario A-1.

Only one underground mine is forecast to open in the area where the skarn-replacement deposit type overlaps polymetallic mineralization. This mine would have a lower probability of development than either underground mine forecast in Scenario A-1, since the highest potential land would be unavailable for development. This mine is forecast to disturb 75-200 acres over an 8-15 year mine life. The mine could yield as much as 2.3 million oz. of gold, 132 million pounds of copper, and 8.8 million oz. of silver, from over 8 million tons of ore reserves (Table 3-8).

Potential mining under this Scenario represents a substantial increase in total production to date in the NWMD. Projected mineral resources to be developed from the underground mine, if developed, would be orders of magnitude greater than the total gold, silver, and copper produced to date in this mining district. Overall NWMD production to date is a reported 62,311 ounces of gold; 692,386 ounces of silver; 1,963,800 pounds of copper; 3,242,615 pounds of lead; and 920,000 pounds of zinc (Elliott, 1992; Reed, 1950).

The risks of acid rock drainage caused by exposing hazardous geologic materials, most notably sulfide-bearing rock,

could increase substantially. Earthmoving and blasting could increase the potential for landslides and snow avalanches. Mine structures and engineered landforms, such as tailings impoundments and waste rock dumps, run the risk of failure in this steep terrain and alpine climate.

The amount and degree of change from baseline conditions as a result of mining under this Alternative could be significant if an underground mine would be developed. Production from an underground mine could represent a substantial increase in overall mineral production in the NWMD. Nonetheless, implementation of the NWM Agreement would cause a long-term adverse impact on mineral exploration and development in the area. Fewer exploration operations than those forecast under Scenario A-1 would occur in the Henderson Mountain area, resulting in no mining activity for the foreseeable future in an area with substantial known ore reserves. Identified mineral resources unavailable for mining under this alternative have been estimated as 2.6 million ounces of gold, 179 million pounds of copper, and 10 million ounces of silver, in over 12 million tons of ore reserves (Table 3-9).

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under this Scenario, all federal lands would be withdrawn from entry. Only private land and presently claimed federal land with valid existing rights (VER) would remain open to mining. The withdrawal would eliminate at least 17,760 acres of federal minerals (68%) from mineral location for a 20 year period.

Available private and federal land (subject to VER) would be concentrated in the Henderson Mountain area, and total no more than 8,400 acres. All of the available mineral land is considered to have the highest development potential in the study area (Map 3-11).

Exploration in some form would be conducted continuously in the Henderson Mountain area. Reconnaissance-scale activity would result in little surface disturbance. More concentrated exploration drilling (as many as 7 separate operations) would each disturb 4 acres and last 2-3 years.

The three mines forecast for Scenario A-1 are forecast under this alternative as well (Table 3-8). Mining would occur almost entirely on private land. Relative to Scenario A-1, the probability of any of the three mines occurring would be diminished due to limited federal land being available for exploration and mining infrastructure.

All direct, indirect, and cumulative impacts from this alternative would be the same as described for Scenario A-1. Long term productivity of the NWMD may be adversely affected since exploration for unknown mineral deposits would be prohibited on the unavailable lands.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under this Scenario, the locatable mineral resources would be withdrawn from entry. Areas with high development potential would not be available for exploration to determine if precious metal reserves are present. This would adversely affect short and long-term potential mineral production in the study area. Changes in mineral economics may not allow for development of these resources if the withdrawal is revoked after 20 years.

This Scenario is the most restrictive to mineral exploration and development. All federal minerals would be withdrawn for at least 20 years. Crown Butte's unpatented claims would be relinquished; its interest would be acquired by the federal government and unavailable for mining. A total of 23,680 acres or 90% of the total mineral land (both federal and private) in the study area would be unavailable. Of the land remaining available for mineral activity, 60 acres are unpatented mining claims subject to VER, and 2,420 acres are patented claims and other private land.

It is forecast that exploration would focus on polymetallic veins in the Republic Mountain area, south of Cooke City, or veins and porphyry deposits near Goose Lake, six miles north of Cooke City. Intermittent reconnaissance-scale exploration and one surface-disturbing exploration program is expected. It is unlikely that exploration would result in development of a mine.

The amount and degree of change from baseline conditions and the cumulative impacts (combined past, present and reasonably foreseeable future mineral activity) resulting from the realization of the NWM Agreement under this alternative would be adverse and significant in terms of lost opportunity. Ore bodies that would not be developed due to the withdrawal and NWM Agreement might not be economically recoverable in the future due to economic or social trends, and/or governmental action.

The combination of a mineral withdrawal and implementation of the NWM Agreement would adversely affect the short-term and long-term productivity of the NWMD. This alternative would preclude opportunities to discover and delineate mineral deposits throughout the study area. It could also preclude mining, for the foreseeable future, in an area containing substantial known ore reserves. This repre-

sents a significant adverse impact to the present use of this area for mineral resource development. Only low potential land would be available in the short-term.

Private Lands and Unpatented Mining Claims

Affected Environment

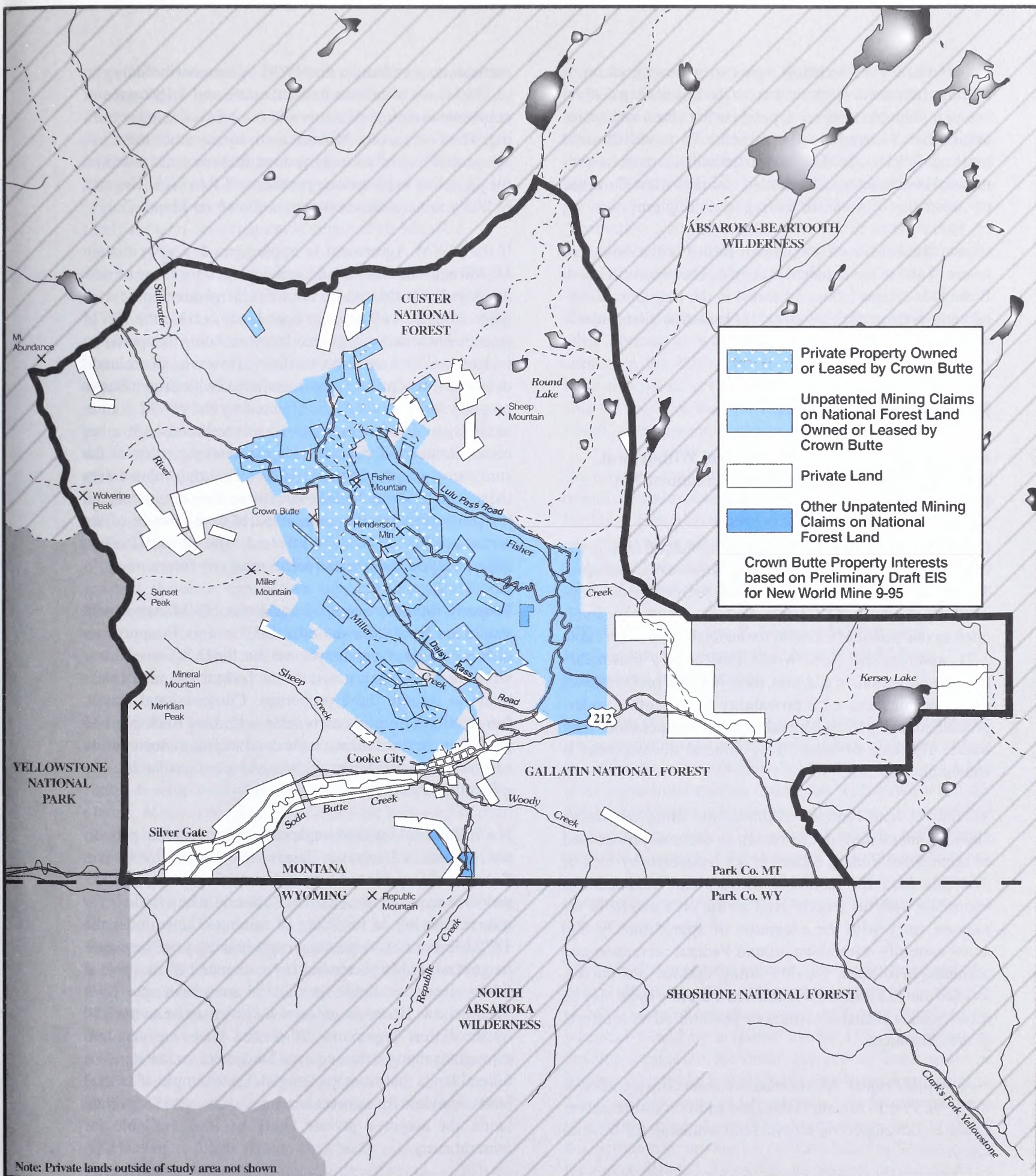
A mineral withdrawal does not effect mineral development on private land or federal land with unpatented mining claims subject to valid existing rights. However, the withdrawal may affect future mineral development on private land and unpatented mining claims because surrounding federal lands are no longer available for mining facilities such as millsites and tailings impoundments.

There are 4,160 acres of private land within the study area. With the exception of 794 acres of land that was patented for non-mining purposes and 49 acres for Cooke Townsite, the private land consists of "patented" mining claims. With the discovery of a valuable mineral deposit, a claimant may obtain legal title (patent) to the surface and mineral rights on the claims. Patented mining claims are concentrated on Henderson Mountain, and along Soda Butte Creek, Fisher Creek, and Miller Creek (see Map 3-13).

Currently, there are 470 unpatented mining claims in the study area. Unpatented mining claims are an area of public land held under the General Mining Law of 1872 on which the U.S. still holds title to the lands but the right of exclusive possession is given to the locator of a valuable mineral deposit. The general location of unpatented mining claims is shown on Map 3-13.

There are three types of unpatented mining claims: lode, placer, and millsites. There are 265 lode mining claims located in the withdrawal area. Lode claims are staked on veins or lodes of quartz or other rock in place bearing gold, silver, or other valuable deposits. Lode claims are located primarily in the Henderson Mountain and Scotch Bonnet Mountain area. Three placer claims, encompassing 65 acres, are located in the lower Fisher Creek drainage. Placer claims are staked on deposits other than quartz or other rock in place, for example, alluvial gravels associated with rivers and streams. Placer gold has little development potential, but the known production in the upper Stillwater River and Soda Butte Creek drainages may encourage casual (recreational) gold panning.

There are 202 millsite claims primarily located in the Fisher Creek drainage. Millsite claims are 5 acres of non-mineral land used for mineral processing and waste rock disposal.



Note: Private lands outside of study area not shown

MAP 3-13

LAND STATUS

To establish valid existing rights to a mining claim, a mining claimant must show that he/she had made a discovery of a valuable mineral deposit on the claim and maintained the discovery to the present. To establish valid existing rights to a millsite claim, the millsite must be non-mineral in character and a mining claimant must show use or occupancy of a site for mining or milling purposes.

Crown Butte Mines Inc. (Crown Butte) is the holder or lessee of 466 of the unpatented claims. The two non-Crown Butte lode claims (about 40 acres) in the Republic Mountain area were probably located for lead-zinc-silver mineralization.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under this scenario, all 22,000 acres of federal land in the study area remains available for mineral entry, and up to 4,160 acres of private land is available for mineral development. The Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes the New World Project is a reasonably foreseeable action. In addition, there is a 10% probability of a surface mine and a 2% probability of another underground mine. Up to 10 mineral exploration operations may occur. The area of most likely mineral development is shown on Map 2-1.

As federal land remains available for filing of mining claims, mineral development that may occur on private land or unpatented mining claims is not hampered by lack of available land for facilities. Current land management continues with all federal land in the area available for mineral entry with the exception of approximately 500 acres currently withdrawn around Federal recreation and administrative sites. Facility siting options are not restricted due to a mineral withdrawal, therefore there may be more options available to mitigate potential adverse effects to area resources.

New World Project. All alternatives under consideration in the NWP PDEIS remain viable, and additional alternatives could be developed on federal land available for mineral entry.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under this scenario, 17,760 acres of federal land and 2,420 acres of private land remain available for mineral entry.

Interests acquired under the NWM Agreement including up to 1740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Forecast for Mineral Activity, assumes there is a 2% probability of an underground mine and the potential for up to five exploration operations (Table 3-2). The area of likely mineral development is shown on Map 2-2.

If the NWM Agreement is implemented, approximately 17,760 acres of federal land remains open for filing of new mining claims (Map 2-2). Future mineral development on these lands as well as on private lands outside the NWM Agreement area could proceed without being hampered by lack of available lands for facilities. However, the mineral development of private land interspersed with Crown Buttes property interests could be affected by the NWM Agreement. Up to 1,700 acres of private minerals and 4,180 acres of unpatented mining claims in the central portion of the study area would not be available for mining-related uses (Map 3-13). As the NWM Agreement does not include all the private land in this area, mineral development of the remaining lands could be affected. The potential affect depends upon the size and location of any future mine.

Property interests acquired under the NWM Agreement would not be withdrawn under this scenario. For purposes of this analysis, the assumption is that the U.S. Government would take necessary actions to protect the investment made to acquire these properties. Congressional action, future NEPA analysis associated with land exchanges or purchases, or restrictions on the deed such as a conservation easement are options to withdrawal acquired lands from mineral entry.

If a withdrawal was not implemented for acquired properties, unpatented mining claims relinquished by Crown Butte would reopen to filing of new mining claims. Private property acquired from Crown Butte could be available for mineral leasing or for filing of mining claims under the 1872 Mining Law depending upon how they are acquired. In general, lands purchased by or donated to the United States are not available for mineral entry under the 1872 Mining Law. However, mineral leasing may be authorized by the Forest Supervisor. If private lands are acquired through exchange, the acquired lands take on the status of federal lands that were exchanged. For example, if federal lands available for mineral entry are exchanged for private lands, the acquired private lands are also available for mineral entry.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under this scenario, 17,760 acres of federal lands are immediately subject to the mineral withdrawal. 4,160 acres

of private land and 4,240 acres of existing unpatented mining claims remain available for mineral development. The Forecast for Mineral Activity, (Table 3-2) assumes the New World Project is a reasonably foreseeable action. In addition, there is a 10% probability of a surface mine and a 2% probability of another underground mine. Up to seven mineral exploration operations may occur. Area of likely mineral development is depicted on Map 2-3.

The immediate effect of a mineral withdrawal is to withhold from future mining 17,760 acres of unclaimed federal land. A withdrawal decision would not affect a claimant's right to hold and maintain valid, existing unpatented mining claims within the study area. Unpatented claims require annual payment of a claim maintenance fee to retain rights associated with the mining claim. If annual filings are performed and there is a discovery of valuable minerals as described under the mining laws, the withdrawal would not affect these rights. However, if either of these conditions are not maintained, rights associated with the unpatented claims would revert to the federal government and the land and minerals would be subject to the terms and conditions of the mineral withdrawal. If an unpatented claim is relinquished, the claim area is then subject to the withdrawal. The mineral withdrawal does not prevent the sale of unpatented mining claims. The rights associated with an unpatented mining claim can be transferred to another party regardless of a mineral withdrawal.

Mineral development could proceed on private land and unpatented mining claims subject to the normal permitting process. The proposed mineral withdrawal could affect future development of private land and unpatented mining claims. Mineral development on private land may depend on adjacent federal land for part of the operation. Without a specific proposal to evaluate, the specific effects of the withdrawal on mineral development on private land is difficult to quantify. However, the recently proposed New World Project serves as an example of the relationship between development of private land and the adjacent NF in this area. Development of the New World Project potentially required the use of adjacent federal land ranging from 113 acres under the off-site tailing disposal alternative to 264 acres under the Lulu Pass/Fisher Creek mill site alternative. Ore processing, tailing impoundments, work camps, access roads, utilities, and ventilation shafts are examples of facilities that may be necessary on surrounding lands.

The lack of available federal land for facilities could result in environmentally less preferable development on private land.

New World Project. The mine can be developed on private land and unpatented mining claims controlled by Crown Butte. The proposed withdrawal would potentially effect

some facility siting options for the New World Project including tailings impoundments and work camps. Three alternatives have either the impoundment or mill proposed outside Crown Butte's claim boundary - the Modified Proposal (pyritic tailings impoundment), the Lulu Pass/Daisy Creek Mill Site Alternative (one impoundment, portion of mill), and the Lulu Pass/Fisher Creek Mill Site Alternative (one impoundment). These areas would be unavailable for facility development if a mineral withdrawal is implemented (Map 3-14).

The proposed withdrawal may preclude the development of other options as well. For example, additional facility options in the Stillwater River drainage and the Kersey Lake area would not be available. Restricting lands available for facilities may result in less environmentally preferred development on available lands.

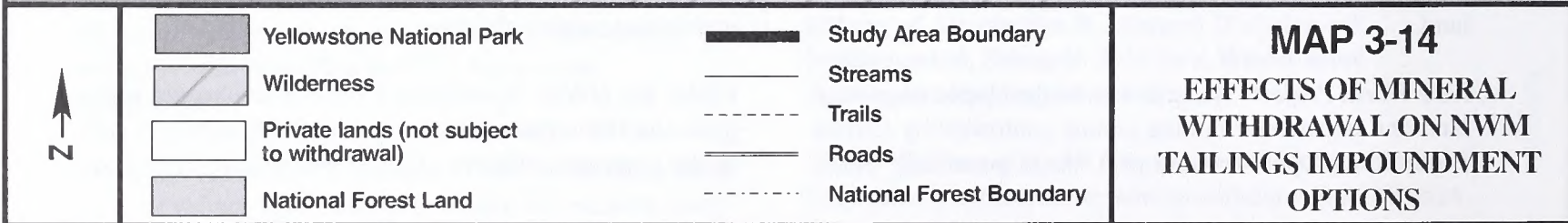
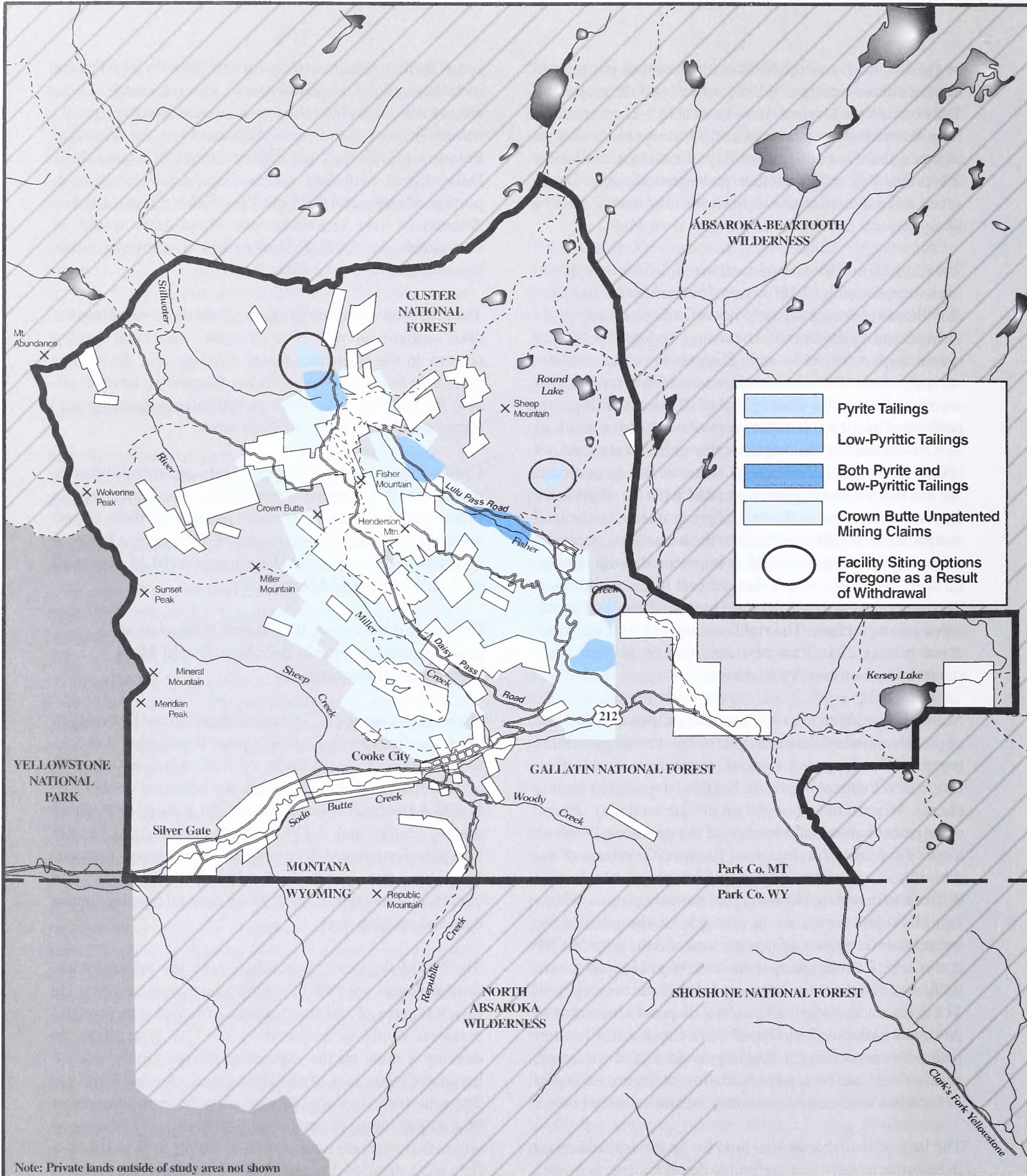
Crown Butte could still use all federal lands with valid mine or millsite claims owned or leased by Crown Butte for mine facilities. Five alternatives could proceed on these claims and on private land owned or controlled by Crown Butte, or on off-site tailing disposal sites on public (BLM managed) land in Wyoming or Montana.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under this scenario, 17,760 acres of unclaimed federal land are immediately subject to the mineral withdrawal and up to 1740 acres of Crown Butte's private minerals and 4,180 acres unpatented mining claims are withdrawn when the NWM Agreement is implemented. 60 acres of unpatented mining claims and 2,420 acres of private land remain available for mineral development. The mineral forecast, assumes no mines would be developed and one exploration operation is possible. Area of likely mineral development is depicted on Map 2-4.

The NWM Agreement combined with the mineral withdrawal closes over 99% of federal land to mineral entry. Up to 1,700 acres of private minerals with high development potential would be acquired by the U.S. The ability to develop a mine on the remaining private land would be hampered by the lack of available sites for mining facilities. The actual effects would depend upon the location and size of a future mine. A small-scale mine may be developed where materials are hauled off-site. Refer to Scenario B-1 for a more detailed discussion of effects to private land and unpatented mining claims.

Under the NWM Agreement, Crown Butte would relinquish the 466 unpatented mining claims they currently hold in the proposed withdrawal area. When these claims are



relinquished by Crown Butte, the land occupied by the claims would be subject to the withdrawal. When Crown Buttes property interests are acquired by the United States, the acquired lands or minerals are subject to the withdrawal.

Forest Plan Consistency

Affected Environment

Forest Service management of federal lands within the study area is directed by the Gallatin and Custer National Forests' Forest Plans. Forest Plans are required by the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA) as amended by the National Forest Management Act of 1976 (NFMA). They provide guidance for all natural resource management activities on National Forest System lands. Plans establish goals and objectives for the multiple use of renewable resources, and standards and guidelines to assure sustained productivity of the land and protection of the environment. In short, goals and objectives identify the types of goods and services to be provided while standards and guidelines set the environmental sideboards within which activities are to be carried out.

Forest Plan direction is established at two scales, forestwide management direction which is applicable throughout the Forest, and management area direction which ties specific goals, objectives, and standards to the unique capabilities of given parcels of land.

Gallatin Forest Plan: Forestwide Direction

Forestwide direction for the Gallatin NF can be found in Chapter II of the Forest Plan. The goals and objectives identified here reflect the types of goods and services to be provided, on aggregate, from the forest as a whole. It is not intended that all goals and objectives be pursued on every acre or within each watershed on the Gallatin NF.

Among the 21 forestwide goals is one which states, "Provide for orderly and environmentally acceptable exploration and development of minerals, oil and gas, and geothermal resources" (FP, pg. II-1). This goal is complimented in the section describing forestwide objectives with a statement that "existing and future rights to prospect, develop, and mine on federal lands available for mineral entry will be recognized in implementation of this Forest Plan" (FP, pg. II-5). Hardrock mining is regulated by the 1872 Mining Law and State and Federal regulations. Reasonable access and the right to operate on valid mining claims is guaranteed under the mining laws. Since the Gallatin NF has potential for hardrock minerals, the Forest Plan direction described above was provided to accommodate this potential use.

The Cooke City area, is one (1) of eight (8) areas on the Gallatin NF recognized in the Forest Plan as having a high potential for active mineral extraction, processing and exploratory operations. Withdrawal of this one area would therefore not lead to a need to amend the forestwide goals and objectives for minerals.

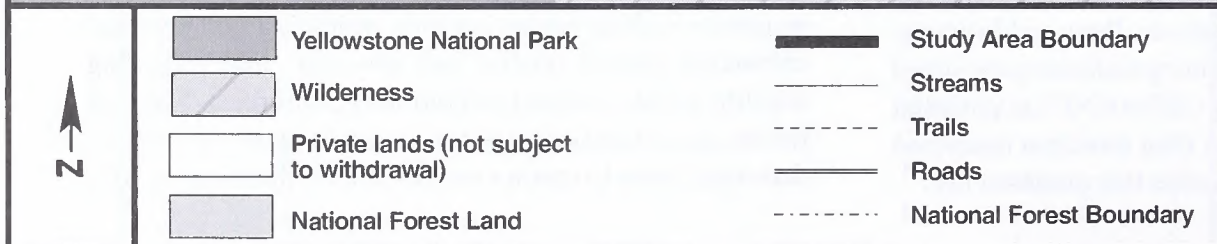
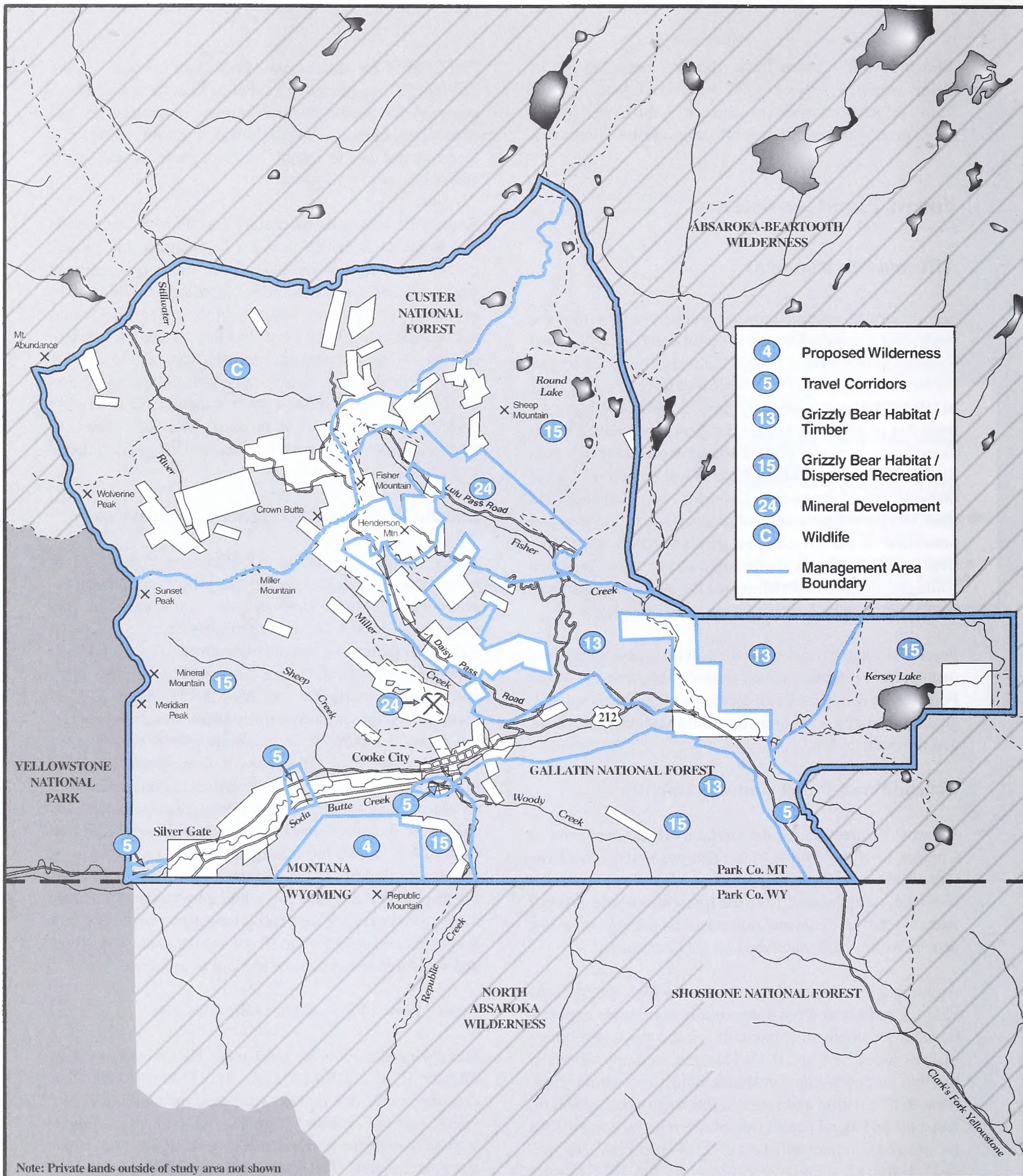
Forestwide standards are designed to limit the magnitude and scope of activities in order to maintain and protect certain conditions of the land. Since mineral withdrawal does not result in the implementation of any ground disturbing activity, compliance with any of these standards would not be a problem. The Forest Plan does contain a standard (FP, pg. II-25), and a set of criteria in Appendix D (FP, pg. d-3,4) for evaluating existing and future mineral withdrawals. However, these criteria are only applicable to smaller withdrawals such as those recommended as a means to protect campgrounds, picnic areas, and other administrative sites.

Gallatin Forest Plan: Management Area Direction

Areas within the Gallatin NF that have had active or recently active mineral extraction, processing and/or exploratory operations were assigned a management area prescription of MA 24, which provides for the exploration and development of mineral resources. The Henderson Mountain area, near Cooke City, includes 1,439 acres within this prescription (see Map 3-15). While MA 24 management direction does not mandate that mining activity occur, it would be inconsistent with the intent of a mineral withdrawal. Therefore, if these lands are withdrawn from mineral entry, as described in Alternative B, it would be appropriate for the Forest Supervisor to also amend the Gallatin Forest Plan to change management area (MA) 24 to match the management area prescription of surrounding lands, MA 15. This management area provides for dispersed recreation use while emphasizing management and recovery of the grizzly bear. Refer to the Gallatin Forest Plan, pages III-47 to III-49, for the goals, objectives and standards that would be applied to this area.

Custer Forest Plan - Forestwide Direction

Forestwide direction for the Custer NF can be found in Chapter II of the Forest Plan. The Custer Forest Plan describes goals in a manner similar to the Gallatin Forest Plan (Custer NF, 1986). The goal for minerals management is to be responsive to the national demand for energy and strategic minerals. The goals for the wildlife and fisheries resources include managing and improving key habitats, enhancing habitat quality and diversity, and providing wildlife or fish-oriented recreation opportunities. The goal for threatened and endangered species is to provide habitat that contributes to species recovery. Like the Gallatin NF's



MAP 3-15
FOREST PLAN
MANAGEMENT AREAS

plan, the Custer NF's plan establishes a goal of meeting State water quality standards.

Custer NF's objectives summarize how the various resources and activities will be managed under the Forest Plan. The objective for minerals development will be consistent with other resource values and management area goals. Objectives for other resources, such as soil, water, timber, and cultural resources are also described in the Forest Plan.

The Forest Plan does contain a standard (FP, pg. II-35) and a set of criteria in Appendix IV (FP, pg. 165) for evaluating existing and future mineral withdrawals. However, these criteria are only applicable to smaller withdrawals such as those recommended as a means to protect campgrounds, picnic areas, and other administrative sites.

Custer Forest Plan - Management Area Direction

The Custer NF within the study area is allocated to Management Area C. This area provides important habitat for grizzly bear and other wildlife. The goal is to manage these wildlife habitats for the optimum quality and diversity that the land can offer. Other resource activities will be modified to maintain or improve the existing habitat.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under Scenario A-1, no federal lands would be withdrawn and there would be no amendments to the Custer or Gallatin Forest Plans. Potential resumption of the New World Project permitting process would not be inconsistent with the Gallatin Forest Plan.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under Scenario A-2, no federal lands would be withdrawn at this time and there would be no amendments to the Custer and Gallatin Forest Plans as a result of this analysis. Property interests including private minerals and unpatented mining claims acquired under the NWM Agreement may be withdrawn at a later date. Any amendments necessary for management of acquired lands would be completed at a later date.

Effects of Alternative B: Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

The National Forest Management Act (NFMA) requires that the Forest Supervisor determine whether a proposed amendment would result in a significant change in the Forest Plan (36 CFR 219.10(f)). Amendments to the Gallatin Forest Plan are proposed under alternative B as an appropriate associated action with a mineral withdrawal. The amendment would change management area MA 24, minerals emphasis, to MA 15, grizzly bear/dispersed recreation emphasis, for those lands that are subject to the withdrawal.

Under this scenario, the permitting process for the New World Project would likely resume. The current MA 24 prescription corresponds closely with the area that would be developed for the proposed New World Project. However, if the Gallatin Forest Plan has been amended to change MA 24 to MA 15, then the resumption of the New World Project permitting process would be inconsistent with the new goals and objectives for the area. While MA 15 does not preclude mineral development, it also does not recognize it as a dominant use. Therefore, the Gallatin Forest Plan would need to be amended to change this area back to MA 24 prior to or in conjunction with a decision to approve the New World Project or other mines.

Management area direction on the Custer NF is consistent with the proposed mineral withdrawal. Appendix IV, Mineral Withdrawal, Custer Forest Plan, and Appendix D, Minerals Management Gallatin Forest Plan, would be amended to include the mineral withdrawal.

If the forest plan is amended as proposed under this alternative, the result would be no effect beyond what would already be affected by the proposed withdrawal action. The amendments would change current direction to reflect that these lands are no longer available for mining. They do not change management emphasis or the level of goods and services to be provided for any other NF resource. Both MA 15 and MA 24, on the Gallatin NF and MAC on the Custer NF, in conjunction with forestwide direction, are consistent in the goals, objectives, standards and guidelines that would be applied to the Cooke City area, excepting mineral exploration and development.

Outputs and activities projected through implementation of the Gallatin Forest Plan are found on page II-8 of the Plan. This table shows that for minerals management, the Gallatin Forest projected a workload of approximately 125 to 200 cases per year. The Custer Forest Plan did not project locatable minerals workload. The Forest Service has no jurisdiction over subsurface resources and therefore Forest Plan goals and objectives do not lead to targets in terms of

production (e.g. tons of ore, ounces of gold, etc.) The level of minerals management activity is also projected in anticipation of outside applications. The Forest Service does not promote or solicit for mineral exploration and development.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

The effects are similar to those described above under Scenario B-1 with the following exceptions. Under this scenario, private land may be acquired, primarily on the Gallatin National Forest. Any private land acquired would assume the management area of the surrounding lands. In this case, acquired private lands would be allocated to Management Area 15, grizzly bear/dispersed recreation emphasis. Private land acquired on the Custer NF portion of the study area would be allocated to Management Area C, grizzly bear, wildlife emphasis.

ECONOMICS

Introduction

This section describes the economic community in and around the New World Mining District and the Cooke City/Silver Gate area of south-central Montana and northwestern Wyoming. A technical background report "Social and Economic Technical Report - New World Project" (7/13/96) was prepared under contract for the Forest Service and serves as a detailed technical background document describing the existing economic environment and potential economic impacts associated with the New World Project. The technical report will be frequently referenced and will be included in the project file for this EIS.

The economic issues identified during the scoping process include:

- Effects on employment - how would a mineral withdrawal in the New World Mining District affect the future employment/unemployment situation in the region?
- Effects on Income - would the proposed action have adverse effects on the income of a region that already has a per capita income substantially below the national average?
- Economic Structure - would economic resiliency, stability, diversity and dependency be affected by the

exclusion of mining and further emphasis on recreation and tourism?

- Effects on Government Finances - how would mining affect government costs and revenues?

Affected Environment

The economic analysis focuses on Park County, MT which is the location of the proposed mineral withdrawal, and Park County, WY which is the potential location of (1) any additional power lines carrying electricity to future millsites in the New World District, (2) the primary transportation corridor for potential future ore hauling, and (3) permanent residences of mine workers.

The economic effects on Cooke City and Silver Gate, MT are emphasized because they are located in the middle of the study area. Other affected communities include Gardiner and Livingston in Park County, MT, and Cody, and Powell in Park County, WY. Livingston, Cody and Powell are the only incorporated cities in the economic analysis area. Some economic effects would extend beyond Park County, MT and Park County, WY, to cities like Billings, MT; but the significance of mining activities on those economies would be less because the economies of those communities are notably larger.

Billings, a city of over 80,000 people is about 125 miles from Cooke City. It could be a source of labor, materials, and supplies; but the effects on its economy would be negligible. The Red Lodge, MT, economy would be affected very little because U.S. 212 over Beartooth Pass is closed for seven months each year because of snow.

Industry Profile

Park County, Montana. Industry in Park County, MT features many small service and retail trade businesses supported by tourism and recreation due largely to its proximity to Yellowstone NP and the location of Livingston on Interstate 90. The largest economic sectors (in terms of earnings) in 1993 were services (28.1 percent), retail trade (15.9 percent) and government, (13 percent).

Mining comprised only 4 percent of the earned income of the economy. Health services was the largest component of the Services sector (35.4 percent), while hotels and lodging comprised 22.0 percent of the Services sector. This is more than four times the state percentage rate for that industry. The eating and drinking establishments industry is the largest component of the retail sector (34 percent) - a rate half again larger than the State of Montana.

Transfer payments (pensions, welfare etc.) accounted for 24.0 percent of total personal income in 1993 compared to 19.8 percent in 1983 (BEA 1995). The rate for the State of Montana is presently around 20 percent.

Industry in the Cooke City/Silver Gate area consists of service and retail trade establishments serving the tourists to Yellowstone NP in the summer, hunters in the fall, and snowmobilers and skiers in the winter. Specific businesses include motels and cabins, restaurants and bars, service stations, general stores, outfitters and guides, and gift/souvenir shops. Not all of these are open year round. A survey of businesses in the Cooke City/Silver Gate area, conducted by Crown Butte in 1990, indicated that employment levels in Cooke City/Silver Gate varied from about 75 full-time and part-time persons in the summer to 20 to 30 persons during the winter. The vast majority of business revenue accrues during the summer.

The Corkran survey (1993) indicated that tourists and outdoor recreationists are the largest sources of Cooke City area business revenues. Tourists, the largest single group of customers, consist of travelers who stop in Cooke City or Silver Gate on their way to and from Yellowstone NP. They may buy gas, food, gifts or even stay a night or two, but their use of the local economy is based on its proximity to Yellowstone NP. Tourists account for about 31 percent of total business revenue. Outdoor recreationists (with 39 percent of total business revenue) may venture into Yellowstone NP, but Corkran states that Cooke City/Silver

Gate and the surrounding wildernesses are the primary destinations for these persons. See Table 3-10 for a complete economic sector profile of Park County, MT.

Park County, Wyoming Cody is the county seat and a major center for tourism in northwestern Wyoming. Cody is the nearest major community to the east entrance to Yellowstone NP. Tourists entering or leaving Yellowstone NP from the east entrance travel through Cody. The only incorporated communities in Park County, WY are Cody and Powell.

The economic sectors with most earnings in 1993 were government (23 percent), services (18.5 percent), mining, oil and gas (14.5 percent), and retail trade (11.8 percent). Although mining accounts for approximately 15 percent of the economy, most of this is from the oil and gas industry.

The largest industry in the Services sector is health services (27.8 percent) with hotels and lodging places second at (22.0 percent). This is more than twice the state rate for the hotels and lodging places industry. The eating and drinking industry is about 25.1 percent of the retail sector which is approximately the same as the state percentage.

Transfer payments in 1993 were 15.9 percent of total income - slightly above the Wyoming state average but substantially below Park County, MT (BEA 1995). Table 3-10 presents a complete economic sector profile for 1993 for Park County.

TABLE 3-10: ECONOMIC STRUCTURE PROFILE (% BY EARNED INCOME - 1993)

Sector	Park Co., Montana	Park Co., Wyoming	Montana State	Wyoming State
Farming	7	7	9	5
Mining	4	15	3	17
Construction	6	9	6	7
Manufacturing	9	5	8	5
Trans, Public Util.	10	4	9	9
Wholesale Trade	4	4	5	3
Retail Trade	16	12	12	10
Finance, Ins & Real Estate	3	3	5	4
Services	28	18	24	17
Government	13	23	20	23
TOTAL	100	100	100	100

Employment and Income

Affected Environment

Park County, Montana. The Park County, MT, labor force has seen constant increases since 1990. The recent unemployment rate has varied from a low of 4 percent in 1994 to a high of 7.8 percent in 1985. Total employment has remained fairly constant or increased slightly on an annual basis since 1980; however, the makeup or distribution of the types of jobs has changed.

The importance of tourism is exemplified by the increase in the number of service and retail trade jobs without major increases in the traditional basic industrial sectors. Since 1980, the number of service and retail trade jobs has more than doubled.

The 1992 per capita income in Park County, MT was \$14,076. Since 1980, earnings have increased significantly in the services, retail, and government sectors. However, earnings have declined in basic industrial sectors such as transportation and manufacturing.

In 1994, average annual wages of workers were \$15,706. Though scarce, the highest paying jobs were mining jobs where wages were more than double the average of other workers in the county. The lowest paying jobs were associated with the services and trade sectors.

Non-earned income (i.e., retirement income, transfer payments, and investment income) is an increasingly important source of income, especially in the Cooke City area. Corkran (1993), found that 66 percent of Cooke City households with seasonal residents have no employment or business ownership ties to the local economy.

Park County, Wyoming. The civilian labor force remained relatively stable from 1990 to 1993, with a 6 percent increase from 1993 to 1994. In 1986, the unemployment rate peaked at 9.4 percent. Since 1986, the unemployment rate has declined to a low of 4.2 percent in 1991 with a 1994 rate of 4.5 percent. This decline is primarily due to job growth in the recreation/tourism economy, which has outpaced growth in the labor force. Since 1986, the unemployment rate has been consistently lower than the state average. Since 1987, total employment has increased almost 15 percent due to growth in services, retail trade, and government. The mineral industry (mostly oil and gas), lost 322 jobs between 1970 and 1986, and then remained relatively stable until 1992 when 174 more mining jobs were lost.

Since 1980, total earnings have increased at an annual average rate of about 5 percent. In 1993, average annual wages for workers were \$19,213, about 11 percent less than

the average wages of all workers in Wyoming. The highest paying jobs are in the mining and federal government sectors while the lowest paying were in retail trade and services.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

The Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes the New World Mine would be developed. It also assumes other mines of similar size could occur, but would be much less likely. In addition, up to 10 mineral exploration operations may occur.

It is likely that employment and income in the region would be directly affected by the mining activity projected above. Activity in mining also creates indirect employment opportunities when the mining firms and their employees spend money for goods and services.

Each exploratory drilling operation would employ up to 10 seasonal workers and would be in operation for a 2 to 3 year period.

Using the NWP as an example, anticipated peak employment from mining would be about 320 in the second year of operation. Direct employment would tend to stabilize by the third year after initiation until project completion (8 to 15 years). It is estimated that mine operations following the construction phase would employ about 180 workers. After mining operations cease, direct employment during closure and reclamation would drop to about 10 people. Operations with off-site tailings disposal would have slightly higher employment. If other mines are developed, employment increases would depend on the size of the mine.

Based on an analysis of the NWP, average income (wages) per new mine worker would be about \$37,000 per year. These wages would be consistent with existing mining and construction wages in the area. Mining would be among the highest paying jobs in the two-county area.

Total peak direct annual income for the NWP would be about \$8.5 million dollars the second year of the project, with total direct annual income during operations of about \$6.5 million starting in the third year of the project. Income would increase if additional mines were developed.

Indirect employment would be created when mining firms purchase goods and services to be used in their production

or when miners purchase personal goods and services. Peak indirect employment from NWP development is estimated to be about 150 persons in the second year of a project. Following the construction phase and during mine operation phase, mining activities would create indirect employment for about 90 workers in the various economic sectors throughout the impact area. Indirect employment would also increase if other mines were developed.

Much of the worker's wages would be spent locally, and would generate indirect employment and income. Analysis of the NWP anticipated that indirect income would peak at approximately \$1.7 million in year 2 when development is at its peak and level off at \$1.0 million during operations. Total income spent locally beginning in the fourth year of the project would be about \$4.7 million.

Any operations with off-site tailings disposal would generate slightly more income. Cody, WY would have the largest share of total project-related construction and operations income. Except for Cooke City and Silver Gate, MT, the projected increase in income would be a small portion compared with current income levels.

Based on analysis of the NWP, it is anticipated that less than 20 miners would become permanent residents in the Cooke City/Silver Gate area, about 200 would live in Wyoming, and 100 would live elsewhere in Montana. The communities that would probably have the largest number of mine employees would be Cody, WY (about 40 percent), Livingston, MT (about 10 percent), Powell, WY (about 10 percent), and Billings, MT (about 10 percent). The employment effect would be most noticeable in the Cooke City/Silver Gate area where almost 20 highly paid workers would change the economic character of the community. (Currently there are only about 20 to 30 employees during the winter and about 80 during the summer.) Mine employees would constitute a relatively small proportion of employment in the other communities.

It is reasonable to expect that mining would cause a slight increase in per capita income for both Park County, MT and Park County, WY. However, this change would be non-detectable in the statistics because of many other unrelated effects on income throughout the economic region.

At the end of mining operations, employment and consequently, income, would be scaled back as mining ceases and final reclamation begins. Total income would gradually adjust to a level that would have occurred without mining projects. Once potential projects close, income and personal spending would decline to what it would have been without the project. Service industries would adjust to the reduced level of spending by scaling back employment and output. The project would constitute a relatively small

proportion of income in all residency areas except Cooke City/Silver Gate, MT, and the adjustment to loss of project income would be most severe in Cooke City/Silver Gate unless the project proponent and county planning mechanisms provide plans for a smooth transition.

Distribution of indirect employment and income would be similar to that of direct employment and income. Here too, the impacts would be most noticeable in the Cooke City/Silver Gate area where almost 20 new employees (miners) would also create additional jobs and income in other economic sectors.

The effects of new mining employees and their families residing in the area would create more spending which itself creates income and employment in the local retail and service industries. Other factors such as year round access to the Cooke City/ Silver Gate area would also result in increased spending.

A mining operation could experience temporary shutdowns or employment cutbacks during project life. If so, unemployed workers might wait for a reopening or look for other employment. The length of time unemployed workers are willing to wait for work is influenced by the availability and terms of unemployment or severance pay, other job opportunities, and the ties to a community. At the end of mining operations, employment and consequently income would be scaled back. Former employees would retire, find other employment in the area, or seek employment elsewhere. Unemployment costs would increase in the short term while they are unemployed.

Temporary project shutdowns or reductions-in-force would have repercussions for other local businesses. Service businesses may lay off employees or curtail services if spending in the area were to decline. Noticeable economic and social stresses within the Cooke City/Silver Gate area would occur during transition periods involving rehiring of direct and indirect employees and/or hiring of new employees to replace those who may have left the area after being laid off.

Other actions that would cumulatively affect employment and income include mine reclamation, powerline construction, plowing Highway 212 east of Cooke City, highway construction, recreation use, and residential development.

It was estimated that it would cost approximately \$6 million to build the necessary power line from Cody to Cooke City (Miller 1996). An estimate of labor and income generated by powerline construction was made using the MicroIMPLAN economic impact model. Approximately \$960,000 in direct wages and 50 jobs would be created along with another \$1.1 million of wages and 75 jobs from indirect spending in the two county impact area (NWP,

PDEIS, Chapter 15). However, this would probably last for less than a year. Also only one 69 kV powerline would be constructed between Cody and a substation near Cooke City.

Recreation use of the Greater Yellowstone Area is predicted to increase regardless of mining activity in the New World Mining District. However, this rate of growth could be affected by the presence of mining in the vicinity. Mining-related changes to the economy, mining-related traffic, and increased access to Cooke City/Silver Gate would add to changes caused by highway reconstruction and other factors all of which would affect recreation related employment and spending in the Cooke City area. It is possible that some businesses in the two-county area, especially those in Cooke City, would suffer short-term losses in recreation/tourism revenue due to the overlapping effects of the highway construction with mining development. However, the specific income (up to \$9 million) effects of mining related activities would be small relative to the overall cumulative future economic environment in the two-county area.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Analysis of this scenario assumes only one mine with a low probability and five exploration operations.

The biggest difference between this Scenario and the Scenario A-1 is that the New World Project would not be developed and a surface mine would not be developed. However, mining could still occur on the remaining federal and private land that would be available for mining. If so, this could generate employment and income effects for one mine similar to those described in Scenario A-1.

The NWM Agreement requires substantial reclamation of past mining impacts in the New World Mining District. The cost of this rehabilitation has been estimated to be approximately \$22.5 million. Until more information is available about the reclamation, it is difficult to predict how much employment and income could be created.

The employment and income effects associated with powerline construction that were predicted for Scenario A-1 would also apply here if a mine is developed. Other mine reclamation, highway construction, recreation use, and residential development would also cause increased employment and income. The amount and extent of these increases is unknown.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Under this scenario, the Forecast for Mineral Activity assumes the New World Project is a reasonably foreseeable action (Table 3-2). In addition, another underground mine and a surface mine are much less likely, but they could occur. Up to seven mineral exploration operations are analyzed.

The effects on employment and income would be similar to those described for Scenario A-1.

Other actions that would cumulatively effect employment and income include mine reclamation, powerline construction, plowing Highway 212 east of Cooke City, highway construction, recreation use, and residential development. Except for powerline construction, the amount and extent of most of these increases are unknown.

Employment and income effects associated with powerline construction would be similar to those described for Scenario A-1 (50 direct jobs would be created, 75 jobs from indirect spending, \$960,000 in indirect wages and \$1.1 million from direct and indirect spending.)

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under this Scenario, the Forecast for Mineral Activity (Table 3-2), assumes no mines would be developed and one exploration operation is possible.

Employment and income generated by mining would not occur. The economy would continue to grow as a result of predicted growth in the tourism industry. An exploratory drilling operation would employ up to 10 seasonal workers and would be in operation for a 2 to 3 year period.

Mine reclamation, highway construction, recreation use, and residential development would cause increased employment and income. The amount and extent of these increases are also unknown.

Economic Resiliency

Affected Environment

Resiliency—the ability to successfully deal with the inevitable, multiple social and economic changes is an important indicator of a community's health and vitality (UCRB DEIS). Harris and others (1995) conclude that resiliency is

relative to population size, economic strength and diversity, attractiveness and surrounding amenities, strong leadership, and other factors such as community residents' ability to work together and be proactive toward change (NWP Tech Report).

Economic Diversity

Economic diversity is considered an important component of economic resiliency. Scoping identified the concern about the loss of diversity in the local economy if the study area was withdrawn from potential mining activities.

There is normally a good correlation between the size of an economy and the amount of economic diversity, i.e., usually the larger the economy the more diverse it is. Another indicator of economic diversity is the total number of economic sectors in the economy, i.e., the more sectors an economy has the more diverse it is. Park County, MT, has 123 economic sectors and Park County, WY has 134 sectors (MicroIMPLAN). When the economies of these two counties are combined as a unit they have a total of 157 sectors. By comparison, Yellowstone County, MT's largest economy, has 207 economic sectors.

The Shannon-Weaver Diversity Index (Alward 1995), also measures economic diversity. This index has increased for every year for which the index was calculated (1977, 1982, 1985, 1990) in both Park County, MT and Park County, WY. This indicates that the economy has become more diverse over the years despite growth and subsequent decline in the minerals extraction industry. Park County, MT shows the sixth highest index out of the 56 counties in Montana. The counties with higher indices have substantially greater populations and larger economies. Park County, WY ranks 8th out of the 23 counties in Wyoming and is also well above the state mean index.

Dependency

Economic dependency (a condition where one or a few industries dominate the economy of a region) is closely related to economic diversity. Scoping comments indicated a concern that the economies in the two county impact area were overly dependent on recreation and tourism. Analysis of economic data validates the claim that the area's tourism economy is substantial. However, the claim that it's relative size is causing the economy to lose resiliency has no scientific support.

Economic Stability

Rapidly fluctuating economic variables are generally not desirable. Such variables include seasonal unemployment rate variation, sporadic population growth rate, and fluctu-

ating income growth rates. These fluctuations cause high social costs, complicate government planning, and disrupt local quality of life. This fluctuation also creates a higher rate of in-migration and out-migration that has its associated social costs.

Park County, MT, has shown significant fluctuations in employment rates compared to other MT counties (Beckley, 1995). However, it has had relatively stable population growth and higher than average per capita personal income growth in recent years.

Another concern was that regional economic stability could be influenced by the proposed mineral withdrawal. There is no evidence that the mining industry has created stable economic conditions in any region over an extended period of time. However, in the short term, an area may enjoy economic prosperity. For example, Jefferson County, which is located north of Park County, MT, now has the highest per capita income in Montana largely due to the Golden Sunlight gold mining operation.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under this Scenario, changes in economic resiliency would be caused by mining operations that would include likely development of the NWP and, although less likely, two other mines. Ten exploration operations are also analyzed.

Changes in economic resiliency would be affected by changes in economic diversity and dependency.

Economic Diversity. Mining activity would increase employment and the number of linked industries that supply goods and services to the mining industries. As the mining industry expands, so would the population, along with the economy and the number of economic sectors. Decreases in other types of economic activity, especially those associated with recreation and tourism, would be localized and relatively insignificant compared to total area development.

In summary, mining would increase the size of the economy, the number of economic sectors, and the Shannon-Weaver diversity index for both counties. All of these measures indicate that mining would increase the economic diversity in the two-county area.

Dependency. Since the mining sector in Park County, MT is insignificant compared to other sectors of the economy,

any likely increase in the mining sector would not increase dependency enough to affect economic resiliency. Although the mining sector in Park County, WY, currently accounts for 15 percent of earned income, this activity is from the oil and gas industry, not hard rock mineral mining. Since these are separate industries, an increase in the hard rock mining would not add to any degree of dependency.

The degree of dependency on the recreation/tourism industry would not be affected by mining. With or without mining, the tourism industry is projected to continue to grow. Except for the changes in winter recreation and tourism use that would be anticipated if US Highway 212 is open in the winter, the absolute size of the tourism industry would change little as a result of mining.

Economic Stability. Year-round mining and access to Cooke City, MT from Cody, WY would probably decrease some of the seasonal variation that is present in the local economies. This high fluctuation is primarily a result of the seasonal tourist industry.

The influx of new workers and their families would create a short growth surge in the county populations, especially in the Cooke City/ Silver Gate area. The population would decrease when the construction phase is completed. However, the present growth rate of the two counties would likely obscure the effects of mining.

The per capita income growth rate would increase because of mining/construction wages that would be significantly higher than the local average. However, any changes to the total economy resulting from mining would be obscured and unmeasurable because of the size of the economies.

These mining projects could affect existing business patterns and the recreation/tourism economy. The sources for these effects would arise from the increased population, increased year-round access to the Cooke City/Silver Gate area, and potential conflict with businesses and/or their customers involved in recreation and tourism activities. Some recreational visitors could be displaced and some businesses could have to adjust to mining-related changes in the local economy. The ultimate magnitude of effects would depend on the number and size of mines operating at one time.

Other actions that would cumulatively effect economic resiliency include mine reclamation, powerline construction, plowing Highway 212, highway construction, recreation use, and residential development.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Analysis of this Scenario is based on the assumption that only one mine would be developed and five exploratory operations would occur on federal lands. However, mine development is much less likely than with Scenario A-1.

There would be less potential for effects on economic resiliency similar to those described for Scenario A-1. Other actions that would cumulatively effect economic resiliency include mine reclamation, powerline construction, plowing Highway 212, highway construction, recreation use, and residential development. The amount and extent of these effects are also unknown.

Effects of Alternative B, Mineral Withdrawal, Scenario B-1: New World Mine Agreement Not Implemented

Under this Scenario, development of the New World Project is anticipated and development of additional mines is possible. Seven exploratory drilling operations are also analyzed.

Development of one or more mines could lead to effects similar to those described for Scenario A-1. Other actions that would cumulatively effect economic resiliency would include mine reclamation, powerline construction, plowing Highway 212, highway construction, recreation use, and residential development.

In the long term, the amount of *diversity* resulting from mining would be less likely than with Scenario A-1 because under this Scenario opportunities for mining expansion would be more limited. In the long term, it is also more likely that tourism would continue to become a larger component of the area's economy and residents of the area would become more *dependent* on tourism spending. Short-term *stability*, as it relates to intra-annual employment fluctuation, would still likely be an economic feature in the area.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented.

Under this Scenario, the only mining activity would be exploratory operations resulting in little change in economic resiliency. The economy would continue to grow as a result of predicted growth in the tourism industry but probably at a slower rate than it would have if mining had occurred. The economy would also be less resilient than if mining had occurred.

Economic growth, which could be accelerated by mining, would not occur. This would reduce the rate of *diversity* development in the local economy. *Dependency* on the recreation and tourism industry would continue to grow. Short term economic stability, as it relates to intra-annual employment fluctuation, would continue to be a problem without the creation of new year-round jobs in the mining industry.

Mine reclamation, highway construction, recreation use, and residential development would also affect economic resiliency. The amount and extent of these effects are unknown.

Government Finances

Affected Environment

Park County, Montana

Government entities within Park County, MT that could be affected by project development include the county, school districts, special districts, and City of Livingston. Since Cooke City, Silver Gate, and Gardiner are unincorporated, funds for services and infrastructure are generally provided for in the County budget.

County Government. Total taxable valuation has grown steadily in Park County since fiscal year (FY) 1987-1988, reaching \$25.6 million in FY 1994. The major component of the tax base in Park County is land and improvements (residential, commercial, and industrial). The major revenue source to Park County is property taxes, which generally accounts for about 50 percent of the general fund.

City of Livingston. Taxable valuation has risen consistently over the past three fiscal years. Revenues were about \$1.67 million in FY 1994, while budgeted expenditures were about \$1.65 million.

School Districts. Potentially affected school district jurisdictions include the Cooke City, Gardiner, Gardiner High School, Livingston, and Livingston High School districts. Generally, mill levies for these districts have risen in recent years to fund increasing budget requirements.

Because of its small size and limited infrastructure and resources, the Cooke City school would be the most vulnerable to growth. The Cooke City Elementary school resumed classes in 1989, after being closed for several years due to low enrollment. Elementary grades (K-8) are taught by one teacher at the school. Enrollment has ranged from 5 to 19 students between 1989 and 1994. The vast majority of the

budget for Cooke City School District is spent as general fund money. Of the total general fund money budgeted, about 70 percent has been for the teachers' salary in recent years.

Special Districts

Within the Cooke City area, there is a water district and a rural fire district. The water district sold revenue bonds to move the water source to the Soda Butte Creek drainage and install a storage tank.

The fire district includes both Cooke City and Silver Gate. The annual budget requirement was about \$13,000, of which about \$8,500 was from current property tax revenue.

Park County, Wyoming

Governmental entities within Park County, WY that could be affected by project development include the county, school districts, special districts, and the cities of Cody and Powell. Since the Sunlight Basin/Crandall area is unincorporated, funds for services and infrastructure are generally provided for in the County budget.

County Government. FY 1994 taxable valuation of the county was \$273.1 million, down about 19 percent from FY 1993. About 60 percent of valuation is from mineral production, primarily oil and gas. Property taxes are the most important component of total revenues needed to fund county government, accounting for about \$3.3 million of county fund revenue in 1994. The remaining non-property tax revenues come from sources such as interest earnings, payments in lieu of tax revenues, forest revenues, state gasoline tax, severance taxes, motor vehicle taxes, and county sales tax. As the county has grown, expenditures have decreased slightly from 1993 to 1995. The county budget was about \$10 million in FY 1995.

City of Cody. Property taxes are a relatively minor source of revenue to the city. The city has an approximate taxable value of \$34.8 million and a 5.006 mill levy for 1994. The majority of revenues to Cody come from state sources (transfers) including cigarette taxes, gasoline taxes, sales taxes, mineral royalties, and severance taxes. The total FY 1994 budget (for all funds) was about \$10.3 million, of which about 80 percent was for salaries and other current expenses.

City of Powell. Assessed valuation in FY 1994 was about \$11.7 million with a millage of 5.000. Property taxes are a relatively minor part of revenues, accounting for about \$58,000 in FY 1994. The total FY 1994 budget (for all funds) was about \$7.41 million, of which about 65 percent was for salaries and other current expenditures.

School Districts. In FY 1994, the taxable valuation for Cody School District No. 6 totaled \$145.1 million or about 50 percent of the total valuation of the county. Taxable valuation was down 4 percent from FY 1993. In FY 1994, property tax revenues from county and operating mill levy accounted for about 45 percent of all general fund revenues. State revenue sources accounted for about 54 percent of general fund revenues. General fund expenditures for Cody School District No. 6 totaled about \$11.4 million in FY 1994.

The FY 1994 taxable valuation for Powell School District No. 1 was \$73.4 million, down 3 percent from FY 1993. Revenues for the general fund in FY 1994 totaled \$10 million, with county and operating levies providing about 34 percent of the total. State sources provide the majority of general fund revenues (about 66 percent). General fund expenditures were about \$9 million in FY 1994.

Special Districts. Special districts include the Cody and Powell fire districts and the West Park Hospital District in Cody. The Cody fire district in FY 1994 had property tax revenues of \$436,093. The Powell fire district had a FY 1994 assessed valuation of \$77 million, a 3 mill levy, and property tax revenues of \$230,341. The West Park Hospital District had a FY 1994 assessed valuation of \$191 million, 5.491 mill levy, and property tax revenues of \$1,050,790.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Analysis of this Scenario is based on the anticipated development of the New World Project, the less likely development of two other mines, and ten exploratory drilling operations.

Mining would have short-term effects on the budgets due to the anticipated increase in population and the demand for local services. Park County, MT, and Park County School Districts would experience budget shortfalls during initial project years. These shortfalls could be mitigated through terms of a Mining Impact Plan.

In Wyoming, Park County and Park County School Districts would experience budget shortfalls that could remain until after mining ceases unless a voluntary Impact Plan could be negotiated to mitigate budget impacts.

The single largest governmental revenue source from mining would be property tax assessments from affected Montana jurisdictions. The NWP is used as an example to

provide a general idea of the possible anticipated effects of a mine operation (Table 3-11). The direct taxable value of a mine would increase during construction and peak with full production (in this case the fourth year of the project). Total taxable value would then decrease slowly as the value of the project facilities depreciate. Jurisdictions in Montana also would receive property tax receipts from the value of the ore produced (gross proceeds taxable valuation) and the assessed value of any new homes and businesses indirectly associated with project development.

Other sources of local government revenues (e.g., sales and use taxes, user fees, intergovernmental transfers) would be affected by the project. However, these revenue sources are generally less important than property taxes.

The costs to cities, school districts, special districts, and counties would increase as the demand for services increases with additional worker and family that moves to the two county area. Impact costs could include capital outlays, personnel costs, administrative, and support costs. These costs would comprise the “full” cost of impacts.

Park County, MT would have primary responsibility for community service and infrastructure effects from the project, including those occurring in the unincorporated communities of Cooke City and Silver Gate. Park County and the affected school and special districts would obtain most of their project-related revenues from property taxes. Total property tax revenues would begin in the second year of a project and likely exceed \$1.2 million by year 5 for the NWP. If additional mines are developed, property tax revenues would also increase.

Another major source of revenue would be the metal mines license tax. Again, the NWP proposal is used as an example for analysis (Table 3-12). Montana levies this tax on the gross value of the mineral produced in excess of \$250,000. Gross value of project production would be subject to taxation at the rate of 1.81 percent of the value of the concentrate produced at the site and shipped off-site. Hard rock mines that pay metal mines license taxes are not required to pay the Montana Resource Indemnity Trust Tax.

Twenty-five percent of the Montana’s metal mines license tax revenue is allocated to the county in which the mine is located. After reserving 40 percent of the county allocation in a trust reserve account, one-third of the remainder would be allocated to the county for planning and economic development activities, one-third would be allocated to affected high school district(s), and one-third would be allocated to affected elementary school district(s).

**TABLE 3-11: ESTIMATED DIRECT PROPERTY TAX REVENUES
FOR PARK COUNTY, MT JURISDICTIONS**

Property tax receipts (M\$)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
County levy	0	5	16	169	322	318
Countywide education	0	8	23	241	459	454
Gardiner High School Dist.	0	5	14	149	283	280
Cooke City elementary Dist.	0	2	5	50	95	93
Cooke City fire districtt	0	1	3	34	65	64
County planning	0	0	0	3	5	5
Soil/water conservation	0	0	0	2	4	4
University millage (State)	0	1	2	16	30	30
Totals (M\$)	0	22	63	664	1263	1248

Note: Taxable valuations provided by Crown Butte. There is no consideration of tax base sharing possibilities. A Statewide School Equalization Levy is not included in analysis. High School students from the Cooke City area would attend school in Gardiner. Assessment would occur in the year following valuation. Half of taxes due would be paid in the assessment year, half in the following year. The 1994/1995 mill levies are used in the analysis. Data Source - NWP Technical Report

TABLE 3-12: ESTIMATED METAL MINES LICENSE TAX REVENUES - MONTANA

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Gross proceeds (M\$)	0	0	35,608	48,336	44,002	41,916
Tax paid (M\$)	0	0	0	640	870	792
Allocation to Park County (25%)	0	0	0	160	218	198
Trust reserve account (40%)	0	0	0	64	87	79
Affected jurisdictions (60%)	0	0	0	96	131	119

Note: Analysis and assumptions based on NWM. Gross proceeds provided by Crown Butte. Tax rate of 1.81 percent on gross proceeds greater than \$250,000. Taxes paid in the year following production. Affected jurisdictions would include Park County and school districts, dependent upon Tax Base Sharing decisions negotiated with Crown Butte. Data Source - NWP Technical Report

The trust reserve account may be expended only following a 50 percent reduction in the mine's workforce or following the mine's closure. Local jurisdictions do not begin to receive revenues until about year 4 of the project. Total annual metal mines license tax revenues accruing to affected jurisdictions are estimated to peak in the fifth year at about \$131,000.

Because potential mine/mill complexes would not be in Wyoming, Park County, WY would not receive property taxes on potential facilities.

Unmitigated fiscal effects on affected jurisdictions are summarized in Tables 3-13 through 3-16. These net effects of costs and revenues are preliminary assessments from available information. The analysis incorporates major potential State diversions to local governments (e.g., sales taxes) but does not consider the specific effects of State equalization programs for education property tax redistribution. School districts in both Montana and Wyoming rely primarily on State funding for operation revenues. The intent of the equalization programs in these states is to provide each school district in the state with sufficient revenue to meet a guaranteed minimum funding level for educational services and facilities.

**TABLE 3-13: POTENTIAL UNMITIGATED NET EFFECTS OF
GOVERNMENTAL COSTS AND REVENUES - PARK COUNTY, MT**

Major revenues (M\$):	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Property tax	0	5	16	169	322	318
Metal mines license tax	0	0	0	32	44	40
Total	0	5	16	201	366	358
Major costs (M\$):						
Existing programs	22	32	33	30	30	30
Cooke City services	100	80	80	80	80	80
Total	122	112	113	110	110	110
Surplus (shortfall)	(122)	(107)	(97)	91	256	248

Note: Analysis does not consider the effects of state diversions, tax base sharing, and other unknowns. (NWP Technical Report)

**TABLE 3-14: POTENTIAL UNMITIGATED NET EFFECTS OF
GOVERNMENTAL COSTS AND REVENUES - PARK COUNTY, MT SCHOOL DISTRICTS (COMBINED)**

Major revenues (M\$):	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Property tax	0	15	42	440	837	827
Metal mines license tax	0	0	0	64	88	80
Total	0	15	42	504	925	907
Major costs (M\$):						
Existing programs	25	61	138	134	134	134
Cooke City facilities/staff	80	80	80	80	80	80
Total	105	141	218	214	214	214
Surplus (shortfall)	(105)	(126)	(176)	290	711	693

Note: Analysis does not consider the effects if state education levy or state equalization programs, tax base sharing, and other unknowns. (NWP Technical Report)

**TABLE 3-15: POTENTIAL UNMITIGATED NET EFFECTS OF
GOVERNMENTAL COSTS AND REVENUES - PARK COUNTY, WY, CODY, AND POWELL (COMBINED)**

Major revenues (M\$):	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Property tax	0	10	20	30	30	30
Sales taxes/fees	5	25	80	100	100	100
Total	5	35	100	130	130	130
Major costs (M\$):						
Existing programs	151	190	177	169	169	169
Hazardous materials	20	5	5	5	5	5
Total	171	195	182	174	174	174
Surplus (shortfall)	(166)	(160)	(82)	(44)	(44)	(44)

Note: Analysis does not consider the effects of state diversions and other unknowns. (NWP Technical Report)

**TABLE 3-16: POTENTIAL UNMITIGATED NET EFFECTS OF
GOVERNMENTAL COSTS AND REVENUES - PARK COUNTY, WY SCHOOL DISTRICTS (COMBINED)**

Major revenues (M\$):	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Property tax	0	15	30	45	45	45
Total	0	15	30	45	45	45
Major costs (M\$):						
Existing programs	35	54	196	178	178	178
Total	35	54	196	178	178	178
Surplus (shortfall)	(35)	(39)	(166)	(133)	(133)	(133)

Note: Analysis does not consider the effects of state education levy or state equalization programs, tax base sharing, and other unknowns. (NWP Technical Report)

The effects on school districts could be mitigated through a voluntarily negotiated Impact Plan process in Wyoming. While a mining operator may assist in mitigation for effects on Wyoming school districts through this process, State of Wyoming Foundation Program funds would also likely be available to these districts on a per-student basis. Because funds are distributed based on prior-year enrollment, funds would not be available through the Wyoming Foundation Program during the construction period. If the Wyoming Foundation Program remains intact, project-related effects on Wyoming school districts would be mitigated with Foundation funding after the construction period. Because the Foundation program is not self-supporting, some portion of funds distributed by the Foundation program would be borne by the State of Wyoming General Fund.

Project closure or temporary shutdowns could adversely affect local governments and taxpayers if community infrastructure or services are over-developed due to potential project demands. It would be important for county planners and governmental leaders to consider project closure in their budgeting and planning decisions. A trust reserve account from Metal Mines License Tax revenues could be used to mitigate closure effects in Montana.

Other actions that would cumulatively effect government finance include mine reclamation, powerline construction, and residential development.

In recent years, employment and population in the study area have grown, and in response, governments have provided additional services and infrastructure, in many cases without sufficient tax revenue increases. Without mitigation (e.g., the Impact Plan processes) mining projects would add to the budget strain on affected jurisdictions in Montana and Wyoming. Because of the many uncertainties involved, the future cumulative budget status for affected jurisdictions cannot be quantified at this time. If necessary, actions

could be taken by these jurisdictions to lessen future cumulative effects (tax increases, user fees, impact fees, etc.). Issues related to the “fairness” of future tax revenues would continue to be of concern to study area businesses and residents.

If powerlines are built from Cody, WY, the transmission facilities would generate property tax revenue for Park County and Cody and Powell school districts. This would not vary regardless of the number of new mines.

Sales taxes, property taxes due to new residential and commercial development, fees, and State diversions would also accrue to the county, with very limited amounts accruing to Cody and Powell.

The State of Wyoming could be responsible for transportation and road costs associated with plowing US Highway 212 and Wyoming Highway 296 (Chief Joseph Scenic Highway). While the jurisdictional responsibility and other issues associated with road plowing and maintenance have not been determined, the State of Wyoming Transportation Department may bear the cost of equipment and manpower, estimated at about \$150,000 to \$200,000 annually. More money would be needed for road improvements if more than three trucks haul large loads over the highway each day. Yellowstone NP estimates that a capital investment of approximately \$750,000 to purchase heavy equipment, sand and equipment storage sheds, a fuel station, snow guides, signs, and gates would also be needed.

The cost of road maintenance and accelerated road improvements in Wyoming may be partially offset by Wyoming fuel taxes for fuel purchased in Wyoming. For an estimated two haul trucks per day round trip from Cody to the mine site, Wyoming fuel tax revenues could be about \$2,500 per year. For any off-site tailings disposal alternatives, the fuel tax revenues would be incrementally higher

(e.g., 20 trucks per day would yield about \$25,000 per year). Other project-related traffic resulting in fuel purchases in Wyoming (vendors, employees, etc.) and license fees allowing interstate transport of materials would generate other relatively minor tax revenues. These revenues are distributed to the State Transportation Fund, which funds highway projects throughout the State on a prioritized basis. It is unknown how much of these funds would be used to repair project related road effects.

The cost of road maintenance would increase with the number of mines. However, it should not be proportionate. For example, if 2 mines are operating at the same time, snow plowing of the highway should serve both mines.

A 1996 amendment to the Wyoming Industrial Development Information and Siting Act would provide substantial revenues to the State of Wyoming for the off-site tailings disposal alternatives. The amendment provides that the disposal of waste as proposed in off-site tailings alternatives would be subject to a surcharge of a minimum of \$10 per short ton of solid waste received at the facility. These funds would be deposited in the Wyoming general fund. For off-site tailings disposal for the NWP, this surcharge would generate a minimum of \$3.31 million annually.

The net effects of mine reclamation, powerline construction, highway construction, recreation use, and residential development on public revenues and government finance would depend on the amount and timing of these activities.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

The analysis of this scenario is based on the anticipation of one mine and five exploration operations.

Although the likelihood and amount of mining anticipated under this Scenario is much less than with Scenario A-1; if mining did occur, impacts on government finance would be similar in nature to those described for Scenario A-1. The extent of impacts would depend on the size, and period the mine operates.

Other actions that could cumulatively effect government finance include mine reclamation, powerline construction, plowing Highway 212 east of Cooke City, highway construction, recreation use, and residential development. Government finance effects associated with these actions would be similar to those discussed for Scenario A-1.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

The analysis of this Scenario is based on the anticipated development of the NWP, and the less likely possibility of two other mines. Seven exploration operations are also analyzed.

The nature of impacts on government finance would be similar to those described for Scenario A-1. Increased demand for services as a result of mining could cause Park County, MT government and school districts to run a short-term deficit and Park County, WY government and school districts to run a long-term or indefinite deficit. Although some of the shortfalls could be mitigated through tax base sharing and state equalization programs, these programs are not always guaranteed and usually do not provide funds immediately.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under this Scenario, no mining is anticipated.

Consequently no changes to government finances would be anticipated. The economy would continue to grow as a result of predicted growth in the tourism industry but probably at a slower rate than it would have if the mining described in the above scenarios had occurred and the resulting the government revenues and cost would change accordingly.

Other actions that could cumulatively effect government finance include mine reclamation, highway construction, recreation use, and residential development. The amount and extent of these effects are unknown.

Mitigation of Effects

Under terms of the Montana Hard Rock Mining Impact Act and Property Tax Based Sharing Act, a proposed project qualifies as a large-scale mineral development requiring the development of an Impact Plan. The Impact Plan would identify affected jurisdictions, and require the operator to pay for costs resulting from project-related impacts. The Impact Plan must be approved before an operator begins. Since the content and subsequent fiscal effects of an Impact Plan constitute a negotiated agreement between an operator and the affected local governments, specific fiscal effects are uncertain. The application of tax base sharing would not be determined until an Impact Plan is finalized.

The Impact Plan process required by Montana does not apply to Wyoming jurisdictions. However, a mining operator, as previously mentioned, could agree to use a similar procedure in Wyoming.

SOCIAL

Introduction

The area considered in this social impact analysis encompasses Park County, Montana and Park County, Wyoming. Adjacent public land jurisdictions, including Yellowstone NP and National Forest (USFS) lands are also considered in the analysis. Although the area is a historic mining district, its diversity of high value of resources and proximity to Yellowstone NP have made mining activity in and around the study area an issue at the local, state, national, and international level.

Due to their close proximity to the proposed withdrawal area, the unincorporated communities of Cooke City and Silver Gate, Montana would be most affected by the proposed withdrawal and the limitations it would place on mining activities. Other communities that would also be affected, but to a lesser degree, are Gardiner and Livingston in Park County, Montana and Cody, and Powell in Park County, Wyoming. Livingston, Cody, and Powell are incorporated cities.

Residents of Cooke City and Silver Gate include both permanent full-time and seasonal residents. Seasonal residents come to the area during the summer months for vacation or retirement purposes. They often have outside income sources such as retirement or investments. Permanent residents generally depend on area resources to make a living. This dependence includes not only consumptive uses such as mining, but also a high level of nonconsumptive use in the form of recreation and tourism.

The economies of Cooke City and Silver Gate are seasonal. Winter access to the area is limited by inclement winter weather which closes two of the three transportation routes. US 212 east of Cooke City is closed during the winter. Winter travel from Cooke City is limited to U.S. 212 west through Yellowstone NP and then north to Gardiner. This isolation has contributed to the development of a seasonal economy, high transportation costs, and a relatively high cost of living. There is no commercial passenger service to the area and heavy commercial freight must come from the east during the nonwinter months.

The social environment of an area is defined by a wide variety of factors such as social organization, leadership, lifestyles, values, and expectations. Quality of life is also an important consideration and can encompass the factors above as well as a wide variety of elements such as clean air, clean water, recreational opportunities, area aesthetics, etc. It also is influenced by elements of the standard of living such as economic opportunity and comforts. Impacts on the quality of life and the social environment are generally measured qualitatively. Individual perceptions about all of the above factors and the net outcome of potential impacts on them, tend to be subjective and personal, depending on the values, beliefs, and social structures of the individual or group.

Concerns expressed during scoping for the withdrawal and its alternative of no action dealt with impacts relative to the character of the area and quality of life. Related concerns were also expressed about population changes, available housing, and community services. Concerns were expressed not only by local residents but also by individuals nationwide, who view the area as a unique national/international resource that must be protected for future generations.

Measurement indicators were identified by the agencies to assess the effects of the proposed action and alternatives in each issue area. The issues, measurement indicators, and the units of measure that will be used to measure effects are outlined in Table 3-17.

TABLE 3-17: ISSUES, MEASUREMENT INDICATORS, AND UNITS OF MEASURE

ISSUE	MEASUREMENT INDICATOR	UNIT OF MEASURE
Effects on population	Direct and indirect immigrants	Population
Effects on community services and infrastructure	Availability of services and Infrastructure	Potential capacity and type
Effects on housing	Available housing stock	Number of housing units
Effects on social structure, social character, and quality of life	Possible changes in lifestyle, quality of life, and psychological/social well-being	Qualitative: narrative description

Population changes can cause significant changes in the social environment of the area. Limited infrastructural and housing capacities in some locations could be affected by population increases.

Population

Affected Environment

Park County, Montana

Table 3-18 displays the 1990 Census population and the average rate of population growth for of Park County, MT and Cooke City/Silver Gate, Montana. In the ten-year period from 1980 to 1990, Park County's population increased 12.6 percent. The largest population growth occurred from 1988 to 1990. From 1990 to 1994 the population has increased another 6.8 percent.

TABLE 3-18: POP. AND AVG. ANNUAL RATE OF POP. GROWTH FOR PARK COUNTY, MT AND COOKE CITY/SILVER GATE, MT

Characteristic	Park County	Cooke City/Silver Gate
Population: (1990 Census) (1994 MT Census & Econ. Info. Ctr)	1560	124
Est. Avg. Annual Pop Growth Rate: (1980-1990) (1980-1994)	1.3%	4.2%

The populations of Cooke City and Silver Gate increased 125 percent from 1970 to 1990. However, in 1990 census boundaries changed, therefore, the rate of growth indicated may not be accurate. Census figures also do not reflect the seasonal nature of the population. Table 3-19 displays a population estimate including seasonal residents.

TABLE 3-19: COOKE CITY AREA PERMANENT/SEASONAL POPULATION SEGMENTS—1991

Location	Permanent Population	Seasonal Population
Cooke City	66	169
Silver Gate	27	149
TOTAL	93	318

Although gateway communities to Yellowstone NP generally have highly transient populations, both year-round and seasonal populations of Cooke City and Silver Gate have shown remarkable longevity and stability. Seasonal resi-

dents have been in the community an average of 25 years, six years longer than year-round residents.

Park County, Wyoming

The population of Park County and the communities of Cody and Powell increased significantly between 1940 and 1990. The state's population increased by 81 percent during this 50-year period. However, from 1980 to 1990 the state's population declined. The 1990 Census population and average yearly rate of population growth for Park County, Cody, and Powell are displayed in Table 3-20. The County population has increased steadily since 1990. The populations of Cody and Powell have also increased since 1990.

TABLE 3-20: POPULATION AND ESTIMATED ANNUAL RATE OF POPULATION GROWTH FOR PARK COUNTY, CODY, AND POWELL

Characteristic	Park County	Cody	Powell
Population: (1990 Census) (1994 WY Dept. of Admin. & Fiscal Control)	24,928	7,897	5,292
Est. Avg. Annual Rate of Pop. Growth: (1980 - 1990) (1980 - 1994)	1.0%	2.2%	0.5%

Future Population Estimates

Table 3-21 displays population estimates for Park County, MT and Park County, WY through the year 2005. These estimates provide a baseline and do not reflect the effects of mine development.

The Montana Census and Economic Information Center and the Wyoming Department of Administration and Fiscal Control report that the population of both counties is projected to grow less than 1 percent per year on average. Park County, MT is projected to grow 9.2 percent and Park County, WY 3.6 percent from 1995 to 2005.

TABLE 3-21: POPULATION PROJECTIONS—PARK COUNTY, MT AND PARK COUNTY, WY

Location	1995	2000	2005
Park County, MT	15,470	16,220	16,900
Park County, WY	24,430	24,910	25,300

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

The Forecast for Mineral Activity, which was developed as one possible Scenario for analysis purposes (Table 3-2), assumes the New World Project would be developed. It also assumes two other mines of similar size could occur, but would be much less likely. Up to 10 mineral exploration operations may occur.

Each mineral exploration program could employ up to nine seasonal workers and operate for two to three years. The effect on the seasonal population would not be measurable.

Projections for the New World Project for this issue and those that follow were obtained from the Social and Economic Technical Report for The New World Project.

The NWP, if developed, could employ approximately 200 workers during full production and operate for 8 to 15 years. The peak population growth projected is about 320 persons, less than 1 percent of the total population for both Park County, MT and Park County, WY.

The majority of the population increases would occur in Cody and Powell, WY. Because of the lack of private lands available for development and limitations on infrastructure, it is anticipated that any company proposing to open a mine in the New World District would restrict residency in the Cooke City and Silver Gate. The peak population growth in these communities could be about 50 persons. This represents 50 percent of the current and historic year-round population and about 13 percent of the combined year-round and seasonal population.

Such an immigration could have numerous effects on the Cooke City/Silver Gate area. The effects on the social structure, character, and quality of life of the area, as well as on the infrastructure and housing are discussed in the sections that follow. They may be viewed as beneficial or detrimental depending on the individual or group and their goals and values.

Other mines, if developed, would have similar effects as those projected for the NWP, depending on their size and location. Mines would not be expected to be in full operation concurrently, however, there could be overlaps between the startup phase of one mine and the shut down phase of another. Such overlaps could increase the magnitude and duration of effects beyond those described above, depending on the degree of overlap. It is unlikely, however, that Cooke City and Silver Gate would be able to accommo-

date more than about 50 additional residents because of the limitations discussed above. Should there be an operational overlap of two mines, the population increase resulting from the second mine would likely be required to live in the more distant communities within the study area.

Mining could necessitate plowing of Highway 212. Year-round access to Cody would increase the area's accessibility to winter recreationists and could result in higher levels of winter use. Such a change could increase the need for added service personnel.

Mine reclamation, powerline construction, and highway construction could create small temporary population increases while active.

Population growth related to recreational use is expected to increase with or without mining in the New World District. The effect mining may have on the rate of that growth is unknown. Recreational use could be affected in localized areas. Some users could leave and others could relocate to other areas. However, there is insufficient information available to accurately predict the net effect on the area's population.

The highways between Mammoth and Cooke City and between Cooke City and Cody, WY are expected to be upgraded and realigned during the next 20 years. Such activity could result in small, temporary, seasonal population increases during project activities.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

The Forecast for Mineral Activity (Table 3-2) assumes there is a 2% probability of an underground mine and the potential for up to five exploration operations.

If developed, a mine would be expected to have effects similar to those described for the NWP discussed under Scenario A-1 above, depending on the size and location of the mine. The effects of each exploration operation would also be similar as those described under Scenario A-1. The NWM Agreement significantly reduces the potential for mining related changes to population in the study area. The area of highest mineral potential is no longer available for development. The NWP would not be developed and the potential for additional mines is reduced.

Other activities that are likely to occur under this Scenario include mine reclamation, powerline construction, and year-round plowing of Highway 212 east of Cooke City. The effects of these activities would be the same as discussed under Scenario A-1.

Cumulative effects from highway construction and growth in recreational use would also occur under this Scenario. Their effects would be the same as discussed under Scenario A-1.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

The Forecast for Mineral Activity, which was developed as one possible Scenario for analysis purposes (Table 3-2), assumes the New World Project would be developed. Up to seven mineral exploration operations may occur. It also assumes two other mines of similar size could occur, but would be much less likely.

The effects on population are similar to those described under Scenario A-1, due to likely development of the NWP. The area of highest mineral potential remains available for mining. Additional mines could be developed, although the probability is somewhat lower than in Scenario A-1 and only seven exploratory drilling operations are anticipated instead of 10. The cumulative effects would be the same.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

The Forecast for Mineral Activity, which was developed as one possible Scenario for analysis purposes (Table 3-2), assumes no mines would be developed and one exploration operation is possible.

No population effects would occur as a result of mining. The single exploration operation could provide seasonal employment for about nine persons. The effects on population would be negligible. Some mine reclamation activities could also occur, causing small, seasonal population increases when active. Cumulative effects would be the same as described under Scenario A-1.

Quality of Life

Affected Environment

Park County, Montana

Park County, Montana has a long history of both consumptive and nonconsumptive uses of natural resources. The area's rich mineral deposits, spectacular scenic beauty, high quality outdoor recreation, and proximity to

Yellowstone NP have been and continue to be factors shaping the history of the area.

Cooke City's early economy was based on mining and shifted to tourism and recreation in the 1930's. The founding of the community of Silver Gate, one mile from Yellowstone NP, in 1935 and construction of the Beartooth Highway in 1936 stimulated tourism. By 1937, there were 59 cabins, a gas station, a tavern, and a few stores in Silver Gate. The last major mining activity was the McLaren Gold Mine in 1953.

During the summer, seasonal residents increase the population of the Cooke City/Silver Gate area by four to five times the number of year-round residents. Permanent residents often are service providers to tourists and recreationists, employees of the National Park Service and Forest Service, and retirees. Seasonal residents typically live in the area during the summer months and maintain primary residences outside of the area for the majority of the year.

Residents and visitors are attracted to the area by the spectacular scenery, abundant wildlife, unique geologic features, and solitude. The quality of outdoor recreational experiences offered by the area is extremely high. Many people obtain spiritual renewal and tranquility from the natural environment found in and around the study area.

Neighboring Yellowstone NP is valued as a national and international treasure to be enjoyed and preserved for future generations. Areas surrounding the park are viewed by many local residents and others from around the United States and the world, as an integral part of the Park ecosystem.

Both permanent and seasonal residents perceive social class distinctions based on period of residency. Business owners and merchants generally are perceived as having more influence than are nonproperty owners who frequently work at temporary jobs. In addition, social separation apparently exists based on views about future development.

Local residents perceive that they have little control over important decisions such as the allocation of tax revenues, development of mining, and provision of community services. They feel that these decisions are made by individuals or agencies over which local residents have little or no influence. There is a general perception that Cooke City and Silver Gate are largely ignored by county government because the area has few voters and is very distant from the county seat.

Other factors contribute to the feeling of lack of control. Tourism and recreation, major sources of community in-

come, are dependent upon visitors who often come from outside of the region or the state. Visitation levels depend upon the seasonal attractiveness of Yellowstone NP, weather, gasoline prices, and other factors outside of the community influence. Commercial access to Cooke City and Silver Gate in the winter is totally controlled by Yellowstone NP.

A survey of Cooke City and Silver Gate residents revealed a belief that resources and power are unequally distributed. Twenty-eight percent feel that county commissioners have the most power to determine the future of the area followed by the federal government (27 percent), environmental groups (12 percent), small businesses (8 percent), and the general public (2 percent). Year-round, local business people are also thought to have influence and political power by virtue of their wealth and access to county officials.

When important events, such as the 1988 Yellowstone NP wildfires occur, ad hoc committees or groups formed to address the potential effects on the community. The Beartooth Alliance and the New World Mining Impact Committee were formed to focus community concerns about regulation and siting of the New World Project and provide a voice for local concerns.

Cooke City and Silver Gate both have a small town atmosphere, with solitude during most months of the year. Mutually supportive networks of family and friends are valued by residents. People respond to each other in an informal and personal manner, know nearly everyone in town, and are aware of an individual's character, occupation, and socioeconomic status. The social interactions between the pro and anti mining factions have become strained as a result of the strong emotions tied to the New World project.

A 1990 Crown Butte survey showed the existence of concerns dealing with a lack of community togetherness, high rates of alcohol consumption, substance abuse, limited social life, substandard housing, and public facilities, the lack of year-round jobs with reasonable incomes, substandard law enforcement, and the potential of mining coming to the area. Negative comments were also received about the control of Yellowstone NP, the USFS, and other agencies over many facets of their daily life.

Most positive comments extolled the natural environment, appreciation of wildlife, quality of life, serenity, recreation, and privacy of the area. Residents were asked to rate social and economic factors as to their importance to the future success of the communities. Clean environment, recreation and tourism, and a low crime rate were rated by both year-round and seasonal residents as the three most important factors. The overall quality of life was rated as above average by 70 percent of year-round residents and 75.8 percent of seasonal residents.

Many respondents to the Crown Butte survey had concerns about the potential for mine development. They felt that although the New World Project would build the economy, the positive effects would be short-term. Concerns mentioned were the possibilities of removing snowmobile trails, mobile home placement among existing housing, mobile home park developments, and displacement of seasonal help and tourists due to mining personnel occupying existing housing units. Of year-round residents responding to the survey, 54.6 percent rated the development of mining as "Not Important" to the future success of the community. Of seasonal residents, 67.5 percent responded in a similar manner. The "Potential for Mining in Area" was rated as the item least liked by 50 percent of year-round residents and 63.1 percent of seasonal residents.

Table 3-22 displays examples of the wide spectrum of community viewpoints about the development of a major mineral project within the study area. It provides a synopsis of the many reasons for the opinions expressed regarding the issue of minerals development, but should not be considered all inclusive.

Park County, Wyoming

Petroleum and tourism industries have been important social and economic factors since the pioneer days. Farming is also an important component in the Big Horn Basin. Ranchers are perceived by some to be conservative landowners with relatively large amounts of political influence and economic resources. Some are retired executives from out-of-state and others are longtime residents whose families date from the homesteading days.

A 1990 Crown Butte survey indicated that slightly more than 90 percent of Cody residents interviewed believe that social classes exist in the community. Most respondents felt that social stratification was based primarily on affluence which also was linked with political influence and control.

Respondents felt that the community is stratified into groups identified as ranchers, retired people, laborers, and business and professional people. In addition to these groups, community distinctions were based on relative wealth and access to political power. Community interaction appears to occur most often within social strata rather than between.

The primary social problems identified by respondents to the Crown Butte survey were drug and alcohol abuse among the young and teenage pregnancy. Respondents liked the natural environment and appreciated the low crime rate and relaxed atmosphere. Negative comments concerned the harsh climate, high prices, city and county government, and the seasonal influx of tourists.

**TABLE 3-22: EXAMPLES OF THE SPECTRUM OF COMMUNITY VIEWPOINTS
ON A MAJOR MINERAL PROJECT**

Favor mineral projects: Why		Uncertain	Oppose mineral projects: Why	
<i>Zealously promotes development.</i>	<i>Generally supports development with environmental safeguards.</i>	<i>Neutral, uncommitted or ambivalent.</i>	<i>Generally opposes development but not unconditionally.</i>	<i>Energetically opposes development.</i>
Expect to gain personally—money, power, or status.	Job or investments at stake. Believes development need not lead to environmental ruin; we can now avoid this	Perplexed: uncertain of what position to take—costs and benefits seem equally balanced.	Believes we need this kind of development but not in our locality (because of its special qualities).	Job or investments at stake. Expects to lose personally—money, power, or status.
Represents an organization that expects to profit from development.	Thinks the local community would benefit economically; e.g., increased spending, reduced unemployment.	Organization favors it but s/he thinks costs probably outweigh benefits for the community at large.	Thinks selected projects would be acceptable if carefully screened, planned, and scheduled to avoid most adverse effects.	Represents an organization that expects to profit or attain its goals if development is halted.
Strong personal commitment to such values as: free enterprise, progress, materialism, consumption.	Thinks s/he would personally benefit, or perceives development as essential to the U.S. economy.	Informed on the issue but indifferent about what happens.	Thinks s/he would lose money or other values would be threatened: hunting, fishing, cheap land, local lifestyles, existing economic activities.	Strong personal commitment to such values as: conservation, ecological balance, preservation.
Believes technology can solve any problem it creates; it is merely underutilized.	Finds this the politically most expedient position to support.	Uninformed; no opinion; has not thought about it.	Opposes development because of peer pressure from friends, co-workers, or ethnic group.	Believes the very survival of humanity is now threatened by pollution, resource depletion, or other types of environmental changes.
Thinks the planet is still rich in resources and environmental degradation is manageable.	Concerned about specific issues: national and regional energy shortages, our dependence on foreign oil, international balance of payments, defense readiness, etc.	Includes: would like to be informed, might then have an opinion; do not care about it; could not do anything about it anyway.	Concerned about specific issues: adequacy of natural resources for future generations, effects on wildlife, air pollution, water pollution, noise, crime, inflation, etc.	Thinks current population growth rates dictate far less per capita consumption.

Source: Wenner, 1992

Seventy-nine percent of the respondents reported that they had no concerns about the proposed New World Project. Positive impacts focused on an economic boost through increased jobs and business activity. Negative impacts mentioned were environmental degradation, increased traffic and road accidents, and the potential for people with deviant behavior moving into the area to work at the mine. More recent surveys now indicate a high degree of concern about the New World Project. Cody Chamber of Commerce surveys show a decline in support for the New World Project and an increase in opposition. Chamber members changed their position from one of "conditional support" in 1993 to a solid "oppose" position in 1995.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

There is a polarization of interests and attitudes regarding mining in the Cooke City/Silver Gate area. Table 3-22 describes some of the viewpoints behind the opinions expressed by area residents. Although proponents and opponents of mining value existing social and environmental qualities of the area, proponents feel that the opportunity for profit and positive changes in lifestyle and quality of life outweigh the negative effects to the existing social and environmental qualities. If mining were to occur, proponents could gain a greater sense of control and many could seek ways to take advantage of new economic opportunities.

Among opponents, there is a strong perception among some that a major industrial development in an area with such high resource values is inappropriate. Any perceived risk that degrades area resources is unacceptable to those who share this view. Many mining opponents feel that mine related opportunities for profit or positive change would be outweighed by negative changes in lifestyle and quality of life. Even some business owners, who choose to close in the winter, are not motivated to change their lifestyles in return for increased economic opportunity.

If mining occurs, opponents could feel frustrated because they had been unable to control factors affecting their lifestyle and quality of life. They might feel that mining was forced on them by outsiders with no real stake in the community. Individual sense of psychological well-being and quality of life could be negatively changed for most mining opponents. Alienation, divisiveness, and lack of community integration could continue between the pro- and anti-mining groups.

After a population increase, existing residents may perceive a reduced sense of community, poor interpersonal relations, and a lack of community integration. Splits could develop between mining supporters and opponents or between old timers and newcomers. Newcomers could have differing expectations and stakes in the community. Their orientation would be toward extractive industry versus tourism and recreation. Therefore, the two groups could have different expectations about the community. Newcomers may not have the long term interest in community values shared by existing residents.

Population growth, together with the introduction of industrial activity could force the disruption of existing social structures and the development of new ones. Structural arrangements of community service organizations could change, which could affect the entire social structure of the community. Political structures and community leadership could also change.

A disparity in income could develop between well-paid mine employees and generally less well-paid local service providers. The lower paid persons could have difficulty completing for goods, services, and housing for themselves and their seasonal employees.

If one or more mines are developed, there could be a decrease in the availability of housing and an increase in housing costs (see discussion of effects on Housing). Intensified competition for housing and housing sites might increase the market and taxable values of existing businesses and residences, placing greater financial strain on existing employers, employees, renters, and property owners.

The integrity of the study area environment has spiritual and/or religious meaning and value for some persons. Such values are highly individualistic and diverse. It is likely that the introduction of industrial activity could cause some residents and back country users to experience a sense of loss and to perceive a reduction in the quality of life that the area has to offer. Additionally, a rapid increase in population, together with increased traffic and commerce, could detract from the sense of solitude currently experienced and valued by many residents and visitors.

Rapid changes, an influx of population, and increased activity may result in increased numbers of strangers, increases in crime, as well as changes in business and travel patterns. The occurrences of stress, anxiety, and depression typically increase under such conditions. New residents may expect indoor recreation as well as outdoor recreation. Inadequate recreation facilities may lead to boredom and increases in alcoholism, crime, and juvenile delinquency.

Year-round opening of the highway between Cooke City and Cody, WY could greatly increase area residents' access to a variety of goods and services during the winter months. Cooke City/Silver Gate businesses and individuals may well benefit from cost savings as well as increased selection. For some persons, this could be perceived as an increase in the quality of life offered by the area.

Residents in neighboring communities would not be affected to the same degree as residents of Cooke City and Silver Gate. Some Gardiner residents may not support additional mining, but the community is not as polarized. Although some residents might feel their quality of life could diminish, they probably would not be affected as directly or intensely as Cooke City/Silver Gate residents. Newcomers could have a better chance of being accepted into existing social structures.

Mining would not cause meaningful changes to Livingston's social environment. Some may oppose mining because of individual or group values, but not necessarily because they would be directly affected.

Cody would likely be the greatest source of local hires and home to the greatest number of new immigrants. A relatively small percentage of Cody residents could be affected directly by mining. Many opponents would be likely to base their opinions on individual or group values which support environmental preservation and conservation. Membership opinion surveys conducted by the Cody Chamber of Commerce indicate a high degree of concern about the New World Project. From 1993 to 1995, support has eroded to a position of solid opposition.

Powell residents could be more likely to support mining because of economic development benefits. It is more likely that miners and their families could be accepted into existing social structures because of the area's history of resource development.

Park County, WY officials have expressed serious concerns regarding the proposed New World Project. Comments received from County government about the Preliminary Draft EIS for the New World Project indicated concern that estimated benefits to the county had been overestimated and that the costs and negative impacts had been understated. Officials feel that while much of the costs related to the development of a mine would fall on Park County, WY, most of the economic benefits would remain in Montana.

Past, current, and reasonably foreseeable future effects of recreation and tourism growth and development would continue to occur with or without mining. These factors have changed and will continue to noticeably change the

social condition in the area. The rate of that growth and its magnitude are the result of many complex factors and cannot be accurately predicted.

Some people believe that mine related growth and development conflicts with current lifestyles and the recreation/tourism economy. Year-round access to the area from Cody together with the development of mining could accelerate and increase the magnitude and number of social changes in the study area over those that could occur without mining activity. The ultimate effects of cumulative change would depend on where projected growth and development occur, the ability of and willingness of residents and local government officials to deal with growth and change, and the level of conflict between the two sources of growth.

National and Worldwide Concerns. Other persons in the U.S. and around the world have also expressed concerns. The protection of Yellowstone NP, known worldwide for its spectacular scenery, abundant wildlife, and unique geologic features, has garnered international attention. Even though they may never have visited Yellowstone NP themselves, many people want to see the Park's resources and the surrounding area preserved for future generations. Although it is unlikely that mining in the study area would cause a change in the social structures for these persons, mineral development could result in a variety of responses including a sense of loss, anger, frustration, etc.

Effects of Alternative A, No Mineral Withdrawal Implemented, Scenario A-2: New World Mine Agreement Implemented

The NWM Agreement significantly reduces the potential for mining related changes to the existing quality of life offered by the area. The area of highest mineral potential is no longer available for mining. The NWP and other potential mines would not be developed. Planned reclamation may improve scenic integrity and water quality of area streams.

Development could occur on federal lands and private lands available for mining. The mineral forecast projects a 1:50 probability of an underground mine. Depending upon the size and location of any future mine, effects to quality of life could be similar to those described for Scenario A-1.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Due to anticipated development on private land and unpatented mining claims, the effects of this Scenario are the same as described for Scenario A-1. The only difference is

that there is a slightly lower probability for the development of the three mines under this Scenario than under Alternative A and only 7 exploration alternatives are projected instead of 10. Cumulative effects would also be the same as discussed under Scenario A-1.

The mineral withdrawal does prevent mining on 17,760 acres of federal land. Scenic integrity, recreation opportunities and roadless areas adjacent to the wilderness and Yellowstone NP would not be directly affected by mining. The potential for mining related changes to the natural integrity of the area are lessened for the 17,760 acres withdrawn.

Alternative B would not result in any identifiable effects specific to any minority or low income population or community. The agencies have considered all public input from persons or groups regardless of age, race, income status, or other social/economic characteristics.

Effects of Alternative B, Mineral Withdrawal, Scenario B-2: New World Mine Agreement Implemented

If the NWM Agreement is implemented, no mines are projected to be developed in the study area. Although the community is currently polarized over the pros and cons of mining, it is likely that the controversy about mining would gradually lessen or be eliminated. Some people in the study area could feel alienated or “cheated” with or without mining. If the prospect of mining were eliminated, the social structure of Cooke City/Silver Gate could adjust to this decision during the next few years. The existing social pressure associated with development of mining would gradually lessen.

As in Scenario B-1, activities anticipated under this Scenario would not result in any identifiable effects specific to any minority or low income population or community. The agencies have considered all public input from persons or groups regardless of age, race, income status, or other social/economic characteristics.

Growth and development would continue to occur without mining. Changes to the existing social environment and quality of life would still occur. Such changes would be more consistent with recent growth trends based on quality of life considerations and the recreational/tourism economy, and would occur gradually and continually. People would continue to be attracted to the area for its amenity values including outstanding scenery, abundant recreational opportunities, and a relatively pristine environment. Real or perceived conflict with industrial activities would be less likely to occur and the existing quality of life and social structure would tend to be maintained.

Community Services and Infrastructure

Affected Environment

Most public services in Cooke City and Silver Gate are provided by Park County or special districts for school and fire. The State of Montana also provides some services and infrastructure to area residents and visitors. Gardiner is moving toward becoming a year-round tourist/recreation based economy. Livingston offers of full range of public services and infrastructure.

The areas in Park County, WY most likely to be affected by mineral development in the study area are the cities of Cody and Powell. Residents are provided a full range of services by these communities, local school districts, and State of Wyoming agencies.

Schools. Cooke City Elementary School District No. 9 is the only educational facility in the immediate vicinity of the analysis area. Its capacity is 10 to 12 students in grades K through 8. After completing the eighth grade, Cooke City students generally attend high school in Gardiner, approximately 55 miles away. Livingston, Gardiner, Cody and Powell have facilities for grades K through 12 that are operating at or near capacity.

Emergency and Health Care Services. Law enforcement is provided by the Montana and Wyoming Highway Patrols and the Park County, MT and Park County, WY Sheriff's Departments. Cody and Powell also have city Police Departments. A mutual aid agreement allows National Park Service rangers, Montana Highway Patrol officers, and Park County Sheriff's deputies from both Montana and Wyoming to handle law enforcement problems in the Cooke City/Silver Gate area.

Fire protection is provided by the Cooke City/Silver Gate Fire District. Yellowstone NP provides backup through a mutual aid agreement. Because their fire fighting equipment and vehicles are not adequate for major fires, the primary goal of the fire district is to prevent fire from spreading to other structures. Livingston's fire district has a combination of full-time and volunteer firefighters. Gardiner, Cody, and Powell have volunteer fire departments. Powell employs a full-time fire marshal.

Ambulance services are provided by Yellowstone NP, which has advanced life support capability and a helicopter for patient transport. A Search and Rescue Unit in the Cooke City/Silver Gate area provides disaster and emergency services. Livingston and Gardiner both have ambu-

lance service. Privately owned ambulance companies provide services in Cody and Powell.

There are no licensed physicians or dentists in the Cooke City/Silver Gate area, which is serviced by a first responder unit. The Cooke City Emergency Medical Services Squad has six EMTs who provide nontransporting, basic life support. The closest full-scale health care is located in Red Lodge, MT, 65 miles from Cooke City via the Beartooth Highway. Heavy snow closes this highway during the winter months. The nearest year-round health care services are located in Livingston, 109 miles away. There is also an outpatient clinic in Mammoth, 50 miles away. It is staffed and operated by West Park Hospital of Cody, WY and is open to the general public year-round.

Cody offers a wide range of health services with 25 physicians, 10 dentists, a 46-bed, full-service hospital, 24-hour emergency services, and a helipad. Powell has a 40-bed hospital with 24-hour service and about 10 doctors.

Water, Wastewater, and Solid Waste Disposal. Cooke City has a spring fed central water distribution system. The system has a total of 50,000 gallons storage capacity and serves about 80 residential and 122 motel unit hookups. Silver Gate also has a spring fed central distribution system capable of storing 20,000 gallons. It serves about 29 residential and 70 motel unit hookups.

A negotiated water rights agreement between Yellowstone NP and the Montana Reserved Rights Compact Commission was discussed earlier under Surface and Ground Water. This agreement prevents significant expansion of water delivery from existing sources by the Cooke City and Silver Gate systems.

The City of Livingston provides water to its residents through a municipal water system supplied by six wells. Water in Gardiner is provided by the Gardiner-Park County Water District. The Shoshone Treatment Plant near Buffalo Bill Reservoir supplies water to both Cody and Powell by means of the Shoshone Municipal Water Supply Pipeline. This system has excess capacity to meet projected needs through at least 2020.

Wastewater is disposed of in septic tank systems throughout the Cooke City/Silver Gate area. Many of the existing systems are old with failing drain fields or seepage pits. Installation and proper operation of septic systems in the area is complicated by a high water table and spring snow melts which saturate the ground. The capacity for additional drain fields is limited by high ground water, steep slopes, and the floodplain for Soda Butte Creek.

Gardiner is served by an aerated sewage lagoon system

operating near capacity. The Cities of Livingston, Powell, and Cody maintain sewage treatment systems operating at 33, 50, and 55 percent of capacity respectively.

Cooke City/Silver Gate area solid wastes are disposed of through the operation of a disposal site on Forest Service land permitted to a county-wide disposal district. Yellowstone NP collects solid waste year-round in these communities and hauls it to an incinerator in Livingston. The ash is disposed of in the Livingston landfill, which has approximately two years of life remaining. Incinerator tonnage has increased consistently over the past decade. The district is currently evaluating its options for bringing the system into compliance with state air quality standards.

Park County Solid Waste District operates four landfills, including one south of Cody and one near Powell. The Cody landfill is situated on BLM land and has an additional eight to ten years of capacity remaining.

Social Services. Social services for Park County, MT are centralized in Livingston. Park County, WY is serviced by offices in Cody and Powell. These offices offer programs such as aid to families with dependent children, food stamps, county medical, Medicaid, and county general assistance. Funding is from federal, state, and county sources. The Montana Department of Family Services covers Park County, MT and offers services such as child protection, investigative services for child abuse and neglect, developmentally disabled programs, and protective services to the elderly. The demand for social services has grown in both counties and agencies report an overload.

Planning. Park County, MT is currently preparing a county-wide Comprehensive Plan. A Zoning District was established in the Cooke City/Silver Gate area in 1993. The District has the authority to control most land use activities, but does not have the authority to regulate mining activities. Park County, WY has a Comprehensive Plan prepared in 1980 which is currently being updated. The County is regulated by Development Standards and Regulations adopted in 1995.

Road Maintenance. Park County, MT currently relies on Yellowstone NP to provide road maintenance and plowing for the Cooke City/Silver Gate area. Park County, WY provides snow removal on portions of U.S. 212 and Wyoming 296. WY 296 and U.S. 212 are plowed as necessary within the 40-hour work week. Overtime is only authorized for life-threatening situations. No sanding or ice control is provided.

Yellowstone National Park. The National Park Service has recently requested that Park County, MT assume full responsibility for providing law enforcement, emergency

medical services, road maintenance and plowing, and solid waste disposal for the communities of Cooke City and Silver Gate.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

The Cooke City/Silver Gate area currently has little or no infrastructure capacity to absorb growth. The development of the NWP is anticipated. There is a possibility that additional mines could be developed. If additional mines are developed, the magnitude and duration of effects would increase. Major development and construction of many types of infrastructural improvements would be costly and limited by physical and weather constraints. Without specific immigrating population residency locations however, it is not possible to determine specific needs. Therefore, a general discussion of the effects follows.

Schools. Population increases could have the most profound effect on the Cooke City school district. Enrollments have fluctuated between five and nineteen students over the last five years. The addition of eight to nine year-round students would require a new school building, an additional teacher, increased administrative costs, and additional supplies.

Most other schools within the study area are also operating at or near capacity. Because of their relative size, they are more likely to be able to absorb some population increases without a great deal of stress. If population increases are evenly distributed over the entire study area, it is possible that schools currently in place could absorb the increased number of students resulting in higher teacher:pupil ratios. However, any concentration of students could easily exceed the capacity of a given school resulting in the need for additional staff, supplies, and administrative services. Student populations exceeding the capacity of current facilities could necessitate the expansion or replacement of those facilities.

Emergency Services. Increased population could result in added demand for the services of the two counties' Sheriff's Departments, Yellowstone NP, and Highway Patrols. Additional personnel, equipment, and office space may be needed to handle the increased workload.

The Cooke City/Silver Gate Fire District could receive an increased number of calls for service due to the population increase and associated increased amount of housing. It is likely that a higher level of service would be needed

requiring additional equipment, training, and administrative support.

Because of mining related truck traffic, and the possibility of hazardous materials being hauled under difficult driving conditions, it may be necessary to form a hazardous material response team in Park County, WY. This would involve costs for personnel, training, equipment, and administration. Such a team could be managed directly by the county or as a division of the fire protection organization.

Ambulance services could continue to be provided by Yellowstone NP, particularly in cases where advanced life support capabilities are needed. If, however, Park County, MT assumes responsibility for emergency services as requested by Yellowstone NP, the area's First Responder unit would need to upgrade to a transporting ambulance service in order to provide an adequate level of service.

Water, Wastewater, and Solid Waste Disposal. The Cooke City/Silver Gate area would have to develop new sources of water to meet the needs of the population growth that would accompany major mining activity. The availability of new water sources within Soda Butte Creek drainage is limited by the Reserved Rights Compact between the United States and Montana.

Increased waste water resulting from population growth and difficulties associated with the septic systems currently in use, could result in the need for development of a sewer system in the Cooke City/Silver Gate area.

Any substantial increase in solid waste could exceed the space available in the 32 cubic yard compactor operated by Yellowstone NP. The domestic solid waste load has risen from just over 150 tons per year in 1989 to more than 300 tons per year in 1993. With the population growth associated with mine development, it is unknown if Yellowstone NP would be able to handle the additional solid waste generated or if Park County, MT would have to take over responsibility.

Social Services. Mining activities could increase demand for social services including public assistance, counseling, and other social support services.

Planning. Additional planning and overall county government administration could be needed in order to provide current services and programs to a growing population. This may result in a need for additional administrative support and associated costs.

Road Maintenance. Mining activities in the Cooke City/Silver Gate area could require increased maintenance and plowing of roads from Cooke City to Cody, Wyoming.

Keeping the roads open during the winter months and the potential for mine-related heavy truck traffic would alter the maintenance costs and traffic patterns on the regional road system.

Areas of major cumulative concern would include schools and public protection/safety. The effects of mining could occur throughout the study area, but could be most severe in the Cooke City/Silver Gate vicinity when added to the effects of other potential growth and development.

Year-round access between Cooke City and Cody, WY could increase the level of recreational/tourist traffic introduced into the area during the winter months. Such an increase in tourism would necessitate increased economic activities in the service sector during the winter months. The personnel required to provide those services would also add to the demand for community services and infrastructure discussed above.

If Yellowstone NP relinquishes its responsibilities for road maintenance and plowing, emergency services, and solid waste collection, Park County, MT government would have to increase the number of county personnel and equipment to provide services to the community.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

The NWM Agreement significantly reduces the potential for mine development. The area of highest potential is no longer available for development. The NWP would not be developed. The potential for mining related changes to community services and infrastructure is low.

There is a 1:50 probability of an underground mine on federal and private land not included in the NWM Agreement. If such a mine is developed, the effects described above under Scenario A-1 could occur. Cumulative effects would also be the same.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

Due to anticipated development, including the NWP, on private land and unpatented mining claims in the central portion of the study area, impacts described under Scenario A-1 would also occur under this Scenario. The only difference is that the probabilities for each projected mine's development are slightly lower.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

In the event that the NWM Agreement is implemented, the community service and infrastructure effects associated with mine development would not occur. The cumulative effects described under Scenario A-1 would also occur here.

Housing

Affected Environment

The U.S. Bureau of the Census (1990) reported that Park County had 6,926 housing units. About 54 percent were owner-occupied, while 27 percent were renter-occupied. Nineteen percent were considered vacant. Most of the vacant housing is attributable to recreational homes. There were 277 housing units in the Cooke City/Silver Gate area. About 22 percent were occupied on a year-round basis. Seventy-eight percent of the homes were classified as vacant with a majority of those (70 percent) being recreational homes. Eighty-seven percent of the total number of housing units were one-unit structures and 4.3 percent were mobile homes.

Year-round housing in the Cooke City/Silver Gate area is very limited, particularly with respect to rental units. Some summer residents reside in local motels. A telephone survey of 12 local motel and cabin rental unit owners by Crown Butte in 1991 revealed that half do not remain open year-round because tourist activity was too slow, their building was not equipped to withstand the winter temperatures, or they could not make money during the off-season months.

The 1990 Census reported 10,306 year-round housing units in Park County, WY. About a third of those were located in Cody and about one-fifth in Powell. About 70 percent of the occupied housing units in Park County were owner-occupied, while the remaining 30 percent were renter-occupied. Homes are generally selling very well in Park County. The availability of both purchase and rental housing is tight.

Environmental Effects

Effect of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

If the mines projected were developed, each would create an associated increase in the demand for housing. Using the

estimated housing demand projected for the New World Project as an example, each mine could result in a demand for approximately 200 homes to house the direct and indirect workforce. Because these mines are not projected to operate at full production concurrently, the resulting demand for housing would be spread out over the 20-year period. Although overlaps in the operating periods for these mines are likely, the extent of those overlaps and their precise effects on housing demand cannot be accurately determined.

The need for these homes could be spread over the study area. However, specific residency patterns cannot be predicted. Housing throughout the study area has been in consistently short supply in recent years. The lack of housing could be most evident in Cooke City and Silver Gate where the potential for new housing is limited by sanitary restrictions on septic tank development and high ground water. Privately owned tracts between Cooke City and Silver Gate have the highest potential for new housing in the immediate area of any potential mining activity.

The increased demand resulting from a new mine would put upward pressure on prices. Because of their relatively high wages, mine personnel could be in the best position to obtain housing compared to workers moving in to take service jobs.

Because of the limited ability to expand infra-structural support and services in the Cooke City/Silver Gate area, it is likely that greater pressure would be placed on the housing markets of other communities.

Non-mine related population growth and the associated increase in housing demand would continue, resulting in a need for an estimated 270 additional housing units within the two county area. Since housing development often lags behind demand, housing could continue to be in short supply resulting in increased housing costs.

Should the mines projected above be developed, mine workers and indirect service workers would add to the existing and projected future competition for reasonably priced single family and rental units. This could occur throughout the study area, but could be most severe in the Cooke City/Silver Gate area. Given the cumulative shortage of homes and rental units, it could be more difficult for existing residents to upgrade their living conditions. There could also be additional pressure to provide lower income housing or manufactured homes that may be of lower quality and/or located in inappropriate places.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

In the event that the NWM Agreement is realized, the effects described in Scenario A-1 above could still occur. The probability of a mine being developed is 1:50. The cumulative effects described for Scenario A-1 would also occur under this Scenario.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented

If the NWM Agreement is not implemented, the NWP would be developed and there are lower probabilities of additional mines. Therefore, the effects described under Scenario A-1 would occur under this Scenario also.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Projected housing demand by workers associated with mining would not occur. The cumulative effects described under Scenario A-1 would also occur under this Scenario.

Conclusion

Under Scenario A-1, if mining occurs, individual communities would face major impacts depending on the residency patterns adopted by immigrating workers. Communities most likely to face major effects are Cooke City and Silver Gate. Although population impacts on the entire study area could be less than 1 percent of the combined populations of Park County, MT and Park County, WY, the effects felt in the communities of Cooke City and Silver Gate could be profound. The infrastructure in these communities has little or no room to absorb growth. Therefore, a major expenditure of funds by Park County, MT government and other local jurisdictions would be required in order to provide an adequate infrastructure and services to immigrating populations. Even with such a commitment of funds, physical and weather restrictions present significant barriers that must be overcome. A housing shortage would require a commitment of funds and land resources to meet housing needs. The mining activity forecast under this Scenario could alter the social character and quality of life in these communities. There could be a loss of some social and cultural values and breakdown or transformation of existing social structures for some people. The magnitude and location of these changes and their effects would depend on individual and/

or group values, goals, beliefs and expectations, and on the willingness and ability of people to adjust to change.

In the event that the terms of the NWM Agreement are realized under Scenario A-2, there is a much reduced likelihood that the effects described under Scenario A-1 would occur. If a single mine were developed, the effects described above could occur but for a shorter length of time and at a lesser magnitude. However, a mining operation would have a profound effect on the communities of Cooke City and Silver Gate.

The effects described under Scenario A-1 could also occur under Scenario B-1, although there is a slightly lower probability that the mines projected would be developed.

With Scenario B-2, no population changes due to mining would be anticipated. No immediate changes would be needed in terms of community services and infrastructure, except as required by the growth in recreation use and tourism. Social structures and quality of life would be maintained, with a gradual easing of tensions between pro- and anti-mining groups and individuals.

CULTURAL RESOURCES

Introduction

Significant cultural resources include historic and prehistoric properties that have been listed on, or evaluated as eligible for listing on the National Register of Historic Places. Prehistoric (NRHP) properties refers to sites occupied prior to significant European contact. Historic period properties refers to sites occupied after European settlement.

A number of laws and regulations protect cultural resources on federal lands. Beginning with the Antiquity Act of 1906, they also include the National Historic Preservation Act (NHPA), the Archaeological Resources Protection Act (ARPA), the American Indian Religious Freedom Act (AIRFA), the Native American Graves Protection and Repatriation Act (NAGPRA), and the federal regulations, 36 CFR Part 800, Part 60 and Part 79.

Guidelines for identifying and protecting cultural resources are given in Section 106 of the NHPA and the implementing regulations, 36 CFR 800. Section 106 requires federal agencies to take into account the effects of their undertakings on significant cultural properties. Significance is defined as being on or eligible for the NRHP. Eligibility for

the NRHP is based on the degree to which a property possesses "integrity of location, design, setting, materials, workmanship, feeling, and association", and

- are associated with events that have made a significant contribution to the broad patterns of our history; or
- are associated with the lives of persons significant in the past; or
- embody the distinctive characteristics of a type, period, or method of construction; that represent the work of a master; that possess high artistic values; that represent a significant and distinguishable entity whose components may lack individual distinction; or
- have yielded or may be likely to yield, information important in prehistory or history (36 CFR 60.4).

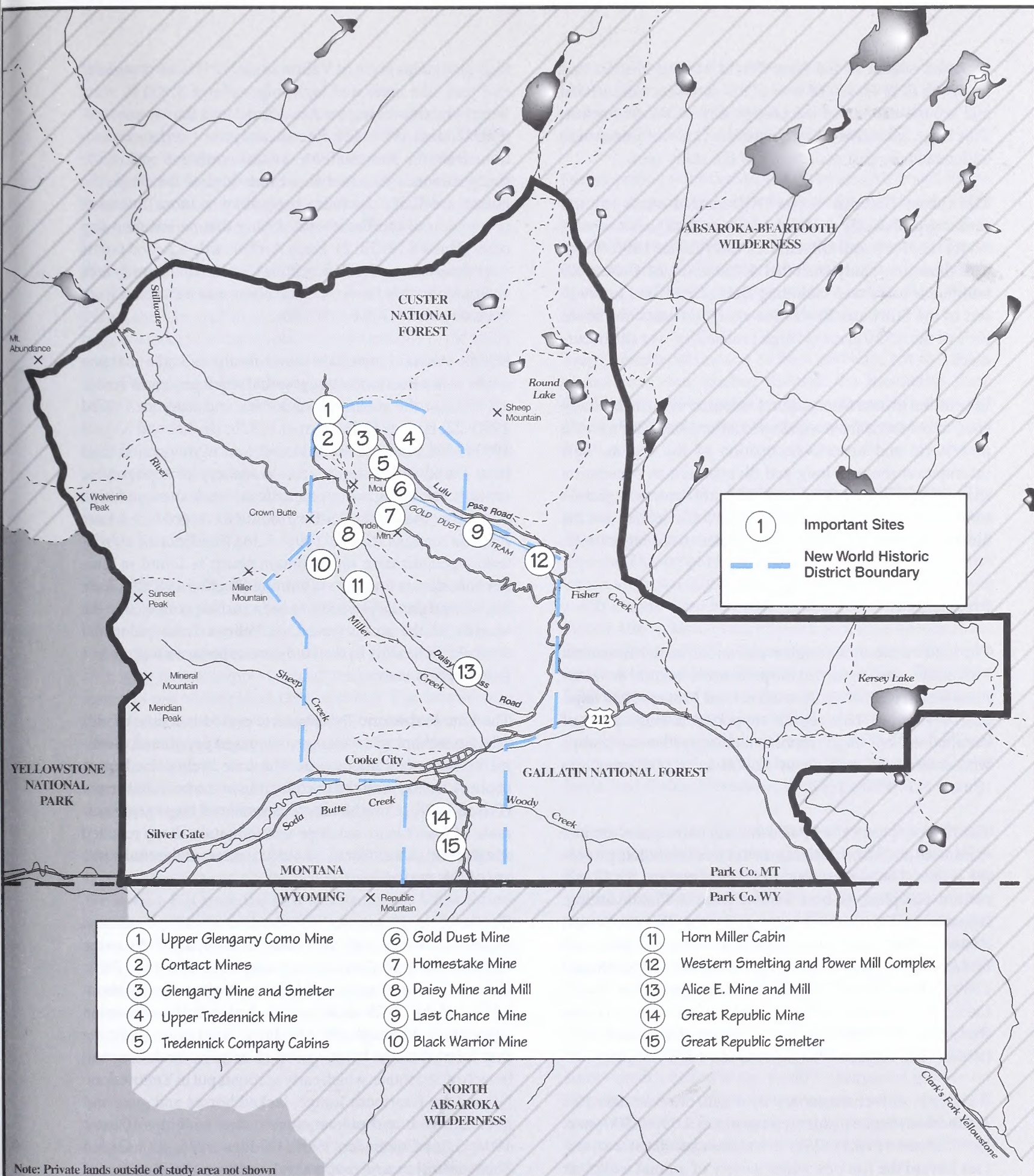
Affected Environment

The study area has been used historically for mining since the late 1860's. Because of its' mining history, setting, and integrity, the area has been listed as the New World Historic District (District) under the National Register of Historic Places. Map 3-16 depicts the boundaries of the District, which is approximately 6,480 acres. The study area also contains other historic and prehistoric resources.

There are 14 known prehistoric sites within the study area, 7 of which are significant under criterion d above. There are 83 recorded historic sites in the study area, 43 of which are significant and contribute to the District. Of these, 7 prehistoric and 24 historic sites are on federal land. The remainder are on private land. Individual historic sites within the District are significant under criteria a,b,c, and d listed above. (NWP PDEIS, Chap 10).

The District is an example of a hard rock mining area showing various forms of metals mining, mine technology, and design (Ferguson 1996: 1). Remains in the District have the potential to add information about the District's history and may more clearly present a picture of the daily lives of its occupants. Events and persons associated with the development of the District have affected local and regional history (Ferguson 1996: 8.12).

Approximately 3,900 acres have been inventoried for cultural resources in the study area. The largest inventory was carried out by GCM Services between 1989 and 1990 as part of the New World Project environmental impact analysis (GCM 1990: 1). The investigation included background



literature search of the New World Mining District and intensive field survey of over 2,500 acres concentrated in and around the site of the proposed New World Project. This large, intensive investigation provides information to understand the past occupation of the study area.

The Custer National Forest (NF) carried out a cultural resource probability modeling study as background analysis for the Beartooth Oil and Gas EIS (Custer 1996: 3.39). The modeling study included 5,750 acres of Custer NF within the study area including Daisy Creek and headwaters of the Stillwater River. The study indicates that about 80% of the 5,750 acres is "high probability" for site occurrence.

In addition to data from cultural resource work in the study area, information from adjacent locations sheds light on the prehistoric and historic occupation of the region. This information shows a long and diverse human occupation spanning the last 12,000 years. The most common prehistoric site type in the study area is the lithic scatter and the most common historic site type is related to mining activity.

Prehistory

The study area, in the higher elevations of the Beartooth Mountains, participated in the prehistoric cultural development which characterizes south central Montana and adjacent Wyoming. This region supported a long series of occupations by small, mobile hunting-gathering groups who entered the area about 12,000 to 10,000 years ago (Custer N.F. 1996: 3.36).

The first peoples, called Paleo-Indian, hunted now-extinct mammoth and bison utilizing distinctive lanceolate projectile points. The earliest Paleo-Indian materials, the Clovis culture complex, is best known from a Plains setting. Apparently Paleo-Indian groups in the Beartooth and Absaroka Mountains developed a mountain adapted culture characterized by the hunting of mountain sheep (Husted 1969; Frison 1978). Sites near Red Lodge and at Mystic Lake, as well as surface finds from locations adjacent to the study area indicate use of the region during this time (Beckes and Keyser 1983: 318; GCM 1990: 19-23).

A climatic shift characterized by warm, drier weather (the Altithermal) began in this area as early as 9,000-9,500 years ago (Cannon 1996:1). With it, a shift in subsistence strategies toward the use of a wider variety of animal and plant resources occurred. Archaic is the term given to the cultural stage associated with these changes. The Early Archaic is associated with the Altithermal, which may have caused reduced occupation of the Plains and increased occupation of the mountainous regions, including the Beartooths. Based on the occurrence of Early and Middle Archaic points in the

high mountains north of Yellowstone NP Haines postulates that park-like areas and high ridges above 8,900 ft. were more habitable during the Altithermal than the lower elevations (Haines 1963: 13). Recent analysis of surface collections from the Beartooth Mountains north and east of the study area indicates that about one-third of the projectile points are Early Archaic, suggesting a more intensive occupation of the Beartooths during that period than any other (Husted 1992b: 2). Early Archaic side notched points were found above 9,600 ft. within 15 miles of the study area and one possible Early Archaic point was recovered from the study area (GCM 1990: 20).

Middle Archaic materials found in alpine and subalpine zones in the Beartooths suggest that small groups of foragers utilized the mountain meadows and canyons (GCM 1990: 22; Haines 1963; Husted 1992b; Beckes and Keyser 1983: 332), but no identifiable remains of this period have been found in the study area. A variety of topographic settings, including mountain valleys, creek sites, and high divides in the Absaroka-Beartooths have produced Late Archaic remains (Custer 1996: 3.36). Evidence of subsistence specialization on mountain sheep is found in Late Archaic sites in northern Wyoming (Puckett 1983: 9). Late Archaic projectile points have been surface collected in the vicinity of the study area. One Pelican Lake point and several fire hearths in the study area appear to represent a Late Archaic campsite.

The Late Prehistoric/Protohistoric period is a time of significant technological change, increased population movements and social interaction. The Late Prehistoric begins about A.D. 500 with the introduction of the bow and arrow (Frison 1978). Communal procurement of large game animals, at least bison, antelope and mountain sheep reached a high point. A number of the lithic scatters in the study area are of this period.

Shoshone peoples moved into the area from the southwest beginning around A.D. 1400. About 1700, the Crow came in from the east (Beckes and Keyser 1983: 116, 337). Horses were introduced to Plains hunting groups by about 1725 and by 1775 most groups had a fully equestrian adaptation. Although the Shoshone were apparently the first Northwestern Plains group to acquire the horse, one branch of Shoshone, which early accounts put in Yellowstone NP and the Beartooth Range, lacked horses and guns and lived in brush and pole shelters called wickiups (Custer 1996: 3.36; Chittenden 1964; Glidden 1976: 83). Called Sheepeaters because mountain sheep were a main source of food, this group is thought to be a mixture of Shoshone and Bannock. These peoples left the Park in the 1870's to join the Shoshone on the Wind River Reservation in Wyoming.

History

The New World Historic District was established to protect the historic resources associated with mining from 1869 to 1942. The District consists of 83 historic properties, of which 43 contribute to its designation as a National Register District. The 43 contributing sites consist of towns, mines, mills, smelters, cabins and other mine features.

Pre-mining. The first white men in the project area were fur trappers and traders who explored southwest Montana during the later part of the 1700's and the 1800's. The first trapper-trader who can be placed with certainty in the study area is John Colter, who traveled through there in 1807. Colter Pass, named for him, is on the northeast side of the study area (Glidden 1976: 63; Chittenden 1964: 22-23).

Several annual fur trading rendezvouses were held in and around the Yellowstone NP area, including the study area. The trapper-trader Jim Bridger was in the Park area between 1841 and 1844 and probably the study area also (Chittenden 1964: 47).

Initial Prospecting (1869-1882). Gold discoveries in the 1860's in such places as Last Chance Gulch in Helena and Alder Gulch in Virginia City brought hundreds of prospectors to southwest Montana in search of riches. Many of the men were former trappers turned prospectors and the study area was one of the places they searched. The first mineral discoveries in the area were made by four such men who, in 1869, fleeing raiding Indians, crossed from Cache Creek into the Republic Creek drainage. They discovered the manganese outcrop on Republic Mountain which was later developed into the Great Republic Mine.

News of the discoveries spread like wildfire as newspapers both in Montana and on the east and west coasts picked up the stories. But since the area was part of the Crow Reservation, capital for substantial investment could not be raised. Still, individuals searching for riches came and by 1875 a small settlement had been established on Soda Butte Creek to supply them. A small "roasting furnace" was built there. This furnace was destroyed in 1877 by a Nez Perce raiding party when Chief Joseph fled through the area. The furnace was burned and lead ore taken by the Nez Perce to make shot.

A major problem in the development of the mining properties and the settlement was the lack of adequate transportation. Since only pack trails connected the area to the outside, transportation costs added so much to the overall costs of production that the mines were often barely profitable. To solve this problem, local people tried to interest Jay Cooke, Jr., son of the Philadelphia financier and a backer of the Northern Pacific Railroad, in bringing a spur line into the

town. The townspeople even voted to name their settlement Cooke City in honor of the investor. However, financial problems prevented Cooke from constructing the spur and the area still lacked adequate transportation.

Development of the ore deposits was also held back by the fact that the area was part of the Crow Reservation. In 1882, pressured by demands of the Cooke City miners as well as ranchers in the Yellowstone River Valley, the government reduced the size of the reservation and the area was thrown open for settlement. People poured in and the New World (NW) Mining District was established.

Transportation continued to be a problem, but in 1882 a wagon road was pushed through the mountains from Gardiner. In 1884 another wagon road was built down the Clark's Fork to connect with the road between Lander and Red Lodge.

Development of the Mining District (1882-1894). The period 1882-1894 was very active for the NW Mining District, with mineral exploration spreading to all parts of the area. This surge in prospecting led to many discoveries which were quickly developed as patented mines. Soon 1,450 claims were recorded in the NW Mining District (Wolle 1963). Most of the named mines were opened in the first half of the 1880's. Some uncovered substantial lodes which continued to be worked for many years. The richest finds of this period were in the north-central part of the area - on Scotch Bonnet, Fisher and Henderson Mountains, at Lulu Pass, and upper Fisher Creek. By 1890, 259 additional claims had been filed on Henderson, Scotch Bonnett, Crown Butte, and Fisher Mountains (Ferguson 1994).

Meanwhile, Cooke City continued to grow. It is estimated that the population hit a peak of about 1,200 people in 1886. Residents renewed efforts to bring a railroad to town, but again failed. The countryside around Cooke City was being settled too. Beginning in the 1880's, farms and ranches provided food and supplies to the mines and community. One of these homesteaders was Enos O. Kersey, for whom Kersey Lake was named (Glidden 1976: 97).

The remaining physical evidence of this period is extensive. Many of the 37 historic sites identified by the GCM survey have remains dating to this period. Many sites include not only the evidence of mineral extraction—adits, stamp mill, assay office, etc.; but also the evidence of domestic activities, such as boarding houses, tent camps, stables, and trash dumps.

In 1893, events far distant from Cooke City caused the virtual cessation of mining activity in the district. In that year silver prices dropped and the nation experienced a recession. By 1894 most of the mines were closed.

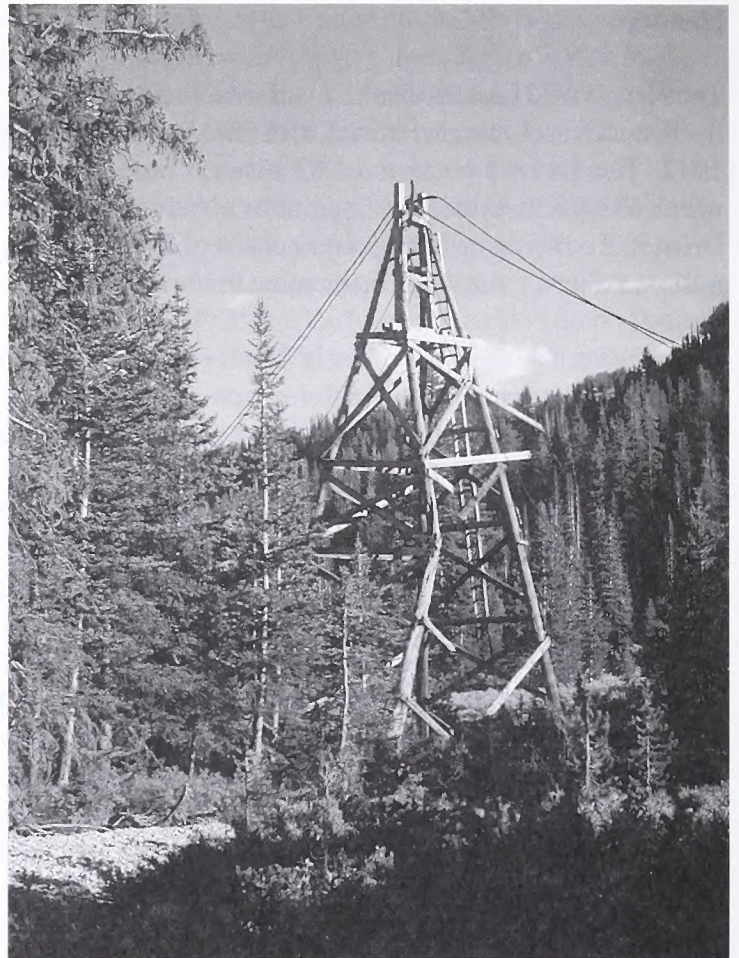
Reorganization and Resurgence (1910-1930). The second period of mining activity began when copper was mined in the area of Goose Lake and Goose Creek, the northern boundary of the study area. While the prior period of mining in the district can be characterized as one of individual prospecting, this period can be viewed as that of the promoter. The leading promoter of New World mining property was “Doc” Tanzer, who acquired claims on Henderson, Scotch Bonnett, and Sheep Mountains and began promoting these operations throughout the United States and in Europe. Tanzer’s vision was to have an integrated operation to accomplish all phases of mineral extraction. To that end, beginning in 1915, the company, Western Smelting and Power Company, built a 250 kilowatt hydroelectric plant on the Clarks Fork River to provide power for all of its operations and constructed a 350 ton copper smelter on Fisher Creek. Believing that the Homestake Mine ore body at the top of Henderson Mountain extended down through the mountain, Tanzer opened the Gold Dust Mine 700 ft. lower to intersect this zone. An aerial tramway was built to connect the Homestake adit with the Gold Dust adit, continuing on to the smelter two miles away.

These constructions completed, investors in the company awaited discovery of the ore body in the Gold Dust. As that adit was pushed farther into the mountain without evidence of the lode however, it became increasingly clear that the ore body would not be located. The collapse of the stock market in 1929 and resulting financial panic proved to be the undoing of the company and of “Doc” Tanzer as well. In 1929, Tanzer disappeared, resulting in the complete shutdown of the operations and the abandonment and deterioration of the smelter, hydroelectric plant and the other company constructions.

Many of the other, smaller companies operating during this period also focused on copper ore. Two of the better known of these, the Glengarry Mining Company and the Tredennick Development Company, lost their financial backing after the stock market crash of 1929 and were abandoned by 1930.

Most of the historic remains in the district are from this second period. They include the numerous structures, tramline, power plant, and smelter of the Western Smelting and Power Company. The Glengarry Mine had an associated tent “city” called Glengarry City. Small smelters were associated with a few mines.

Predominately Open Pit Mining (1934-1942). This period saw much less activity than the earlier ones. Mining that occurred was predominately open pit mining. The New Year’s Gift Mine on Fisher Mountain, opened by the McLaren Gold Mines Company, produced mainly gold and silver. The Black Warrior, Upper Glengarry-Como, and



Remnants of aerial tramway in the Fisher Creek drainage.

Alice E. mines also operated at this time. This period ended in 1942 when gold mining was deemed a nonessential wartime activity and the labor force turned to the WWII effort. Some structures remain at the above sites, but forest fires in 1988 destroyed those at the Alice E. mine.

Development of the Recreation Industry. The development of the recreation industry in this area is in part due to the natural scenic qualities of the district itself and in part to its location adjacent to Yellowstone NP. Although mining was Cooke City’s economic mainstay during the early 1900’s, the recreation industry, which would later replace it in economic importance, began during this time. In 1919, guided horseback trips were offered out of Cooke City. Grasshopper Glacier, between Cooke City and Red Lodge, was a favorite spot to visit (Hansen 1962: 16).

Many places of grandiose and unspoiled nature could be found around Cooke City and the district’s inaccessibility made it even more attractive to those tourists who were able to reach it. However, the development of recreation as an economic mainstay really only began after the construction of the Beartooth Highway from Red Lodge to Yellowstone NP. Interest in a highway “across the top” goes back to shortly after the turn of the century, when a Red Lodge citizen’s group championed the tourism benefits of the

scenic eastern approach to Yellowstone NP. Following several years of lobbying disappointments, the biggest boost came in 1925 when Montana Congressman, Scott Leavitt, attached the proposed route as an amendment to his Park Approach Act. In 1931, the bill was signed into law and funding for the highway was approved (James 1995: 21-23). The highway was constructed between 1932 and 1936 following, in part, trails blazed by trappers over a century earlier.

Traditional Cultural Properties

The American Indian Religious Freedom Act (PL 95-341) requires that federal agencies consider the effect of their actions on American Indian traditional uses. To do this, federal land managers notify the appropriate Indian tribe in advance of upcoming projects and seek comment on the effect of the project on traditional cultural properties, if any, in the analysis area.

While several tribes may have used the study area in the past, the Shoshone and Crow are known from historic records to have occupied the area (Beckes and Kayser 1983; Chittenden 1964; Glidden 1976). The last Shoshone left the area in the 1870's to reside on the Wind River Reservation in Wyoming. The study area was part of the Crow Reservation until 1882.

The Crow, Shoshone, Shoshone-Bannock, Arapaho, and Northern Cheyenne tribes were consulted regarding the potential presence of traditional cultural properties in the study area. No traditional properties were reported.

Environmental Effects

Kinds of Effects

According to 36 CFR 800.9(a) an undertaking "has an effect on a historic property when the undertaking may alter characteristics of the property that may qualify the property for inclusion in the National Register of Historic Places." An effect may include an alteration to the property's characteristics of location, setting or use. 36 CFR 800.9(a) defines adverse effects as follows: "an undertaking is considered to have an adverse effect when the effect on a historic property may diminish the integrity of the property's location, design, setting, materials, workmanship, feeling or association". Adverse effects include, but are not limited to:

- physical destruction, damage or alteration of all or part of the property,

- alteration of the character of the setting when that character contributes to the property's qualification for the National Register,
- introduction of visual, audible or atmospheric elements that are out of character with the property or alter its setting.

A direct effect occurs when the action of the undertaking itself impacts the cultural resource. For example, a road or other construction which demolishes or damages a site. An indirect effect is not caused by the action itself but is the secondary result of the undertaking. An example would be a new road which allows public access to previously secluded cultural resources and which results in artifact collection or damage of structures at the site due to increased public visitation. Cumulative effect refers to the impact of more than one undertaking on the cultural site.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented

Under this Scenario, all 22,000 acres of federal land in the study area remains open to mineral entry, and up to 4,160 acres of private land is available for mineral development. The Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes the New World Project would be developed. In addition, there is a 10% probability of a surface mine and a 2% probability of another underground mine. Up to 10 mineral exploration operations may occur. The area of most likely mineral development is shown on Map 2-1.

Surface disturbing activities could include exploratory drilling, adit excavation, gravel extraction, the construction of associated mining facilities and camps, construction of access roads and powerlines, disposal of waste debris, etc.. The seven known significant prehistoric campsites in the study area are all on federal land. There is a high likelihood of impact to these resources because of their proximity to areas of likely mineral development and associated facility construction (Walt Allen, personal communication, 1996). Direct effects could be physical damage from road construction, mineral exploration, mine development, and the construction of related mine facilities and camps. The cultural resource laws mentioned above require mitigation of the impacts of projects such as these on significant sites. Mitigation could include changing the location of impacting activities or data recovery through archaeological excavation and could reduce the effect of data loss from mining related activities.

The 24 significant historic sites on federal land are known to include properties from the first and second periods of

mining activity in the District. The Gold Dust Tram Line and parts of the Western Smelting and Power Company complex are among these. Mineral exploration and subsequent mining activities could cause adverse effects to these properties individually and to the District.

In addition to the effects of physical damage are the effects to the historic character of the District. Character of setting of the District comes from the isolation, placement of the structures within the landscape, terrain, topography, and other features of the land. Whereas more of the significant individual historic sites are on private lands, the federal lands provide a great deal of the District's character of setting. Future mining could result in direct effects to the character and integrity of the District. Examples might be impacts from the introduction of modern mining constructions such as impoundments, powerlines, buildings and facilities which cause visual and audible elements out of keeping with the setting.

Mitigation by data recovery addresses the physical damage to the sites. Impacts to the character of setting and the integrity of the District are more difficult to mitigate but might include efforts to blend the facilities into the surrounding terrain, for example. The degree to which these mitigation techniques would succeed depends in large part on the size and nature of the mining facilities and their location in relation to the historic properties.

Indirect effects of Scenario A-1 would probably also occur and could, over time, result in almost as much damage to the cultural properties as the immediate direct effects. These indirect effects would impact both prehistoric and historic sites. For example, roads which are initially constructed for geophysical exploration and mining could provide access to currently secluded cultural sites, exposing them to artifact collection and damage from vandalism.

The New World Project. The proposed New World Project (NWP) serves as an example of mining-related effects that could occur to cultural resources. The area of potential effects of the NWP overlap approximately two-thirds of the New World Historic District. The overlapping portion contains most of the historic sites which contribute to the District and all but one (the Alice E. Mine and Mill) of the sites which are listed as important to the integrity of the District in the NWP PDEIS, Fig. 10-1, 10-2.

The NWP PDEIS (Chapter 2) lists eight possible mine alternatives. Two of these would physically affect three or four prehistoric sites. Mitigation by data recovery (archaeological excavation) would reduce the effects.

Three of the eight mine alternatives would adversely affect significant historic sites (Gold Dust Mine, Gold Dust Tram,

Western Smelter and Power Mill Complex, Tredennick Company Cabins, Glengarry City). These alternatives would substantially change the characteristics of location, setting, feeling and the association of the sites. Affected sites would no longer be eligible for the National Register of Historic Places.

These three mine alternatives would also adversely affect the Historic District to such an extent that the historic integrity of the District would be destroyed; the District would no longer be eligible for listing on the National Register. The main adverse effect from these three mine alternatives would come from a large tailings impoundment and other mine facilities which would be located in Fisher Creek. Fisher Creek contains a large number of historic sites that contribute to the overall setting and feeling of the District. With a large impoundment and other facilities in Fisher Creek, the District would no longer be able to convey a sense of time and place, or to represent a historic period (NWP PDEIS, Chap 10, pg. 8,9).

The other five mine alternatives would indirectly affect significant historic properties (Gold Dust Mine, Black Warrior Mine, Horn Miller Cabin, Glengarry Mine and Smelter, Upper Tredennick Mine). With mitigation, however, the intrusion of these historic resources would not affect the characteristics of location, setting, feeling or association so much that they would lose their eligibility for the National Register (NWP PDEIS, Chap 10, pg. 7).

These five mine alternatives would also cause indirect effects to the Historic District. These alternatives would reduce the integrity of the District but would not destroy it. Under all of these alternatives except the Off-Site Tailings Disposal Alternative, a large tailings impoundment would be within the Historic District but not in Fisher Creek. Even so, the District would continue to convey a sense of time and place and to represent a historic period. Therefore the integrity of the District would remain.

If additional mines are developed, there is an increased risk of effects on cultural resources. Future mining activity is most likely where skarn and porphyry overlap (Mineral Forecast, Appendix B), which is the core of the Historic District.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented

Under this Scenario, 17,820 acres of federal land and 2,420 acres of private land remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for min-

ing. *The Forecast for Mineral Activity, (Table 3-2), assumes there is a 2% probability of an underground mine and the potential for up to 5 exploration operations. The area of likely mineral development is shown on Map 2-2.*

The NWM Agreement helps protect individual cultural resources and the integrity of the New World Historic District. The 1,700 acres of private mineral interests and the 4,180 acres of unpatented mining claims form the heart of the District, containing many of the sites that contribute to the District. As the area of highest mineral potential is no longer available for mining, the mining-related risks to cultural resources would be reduced and the setting of the area would more likely be maintained.

17,760 acres of federal land remain available for mineral entry. Mineral exploration on these lands would focus on the skarn area, especially where skarn overlaps porphyry (Mineral Forecast, Appendix B). Since a good deal of the historic mining activity was associated with the Homestake deposit and the skarn area, many of the significant historic sites occur in areas which are likely to be impacted by future mineral exploration and development. The potential impact would be greatest on the northern half of the Historic District since this is where the skarn occurs and where the Homestake deposit is known to occur.

If an underground mine is developed, the effects could be similar to those described above for the New World Project under Scenario A-1. The effects would vary depending upon the size and location of a future mine.

Federal lands available for facility siting under this alternative may help mitigate potential effects to cultural resources on private land. Whereas inventoried cultural resources are concentrated on private lands, facility development on nearby federal land may avoid or lessen impacts to cultural resources on private land.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1, New World Mine Agreement Not Implemented

Under this Scenario, 17,760 acres of federal lands are immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims remain available for mineral development. The Forecast for Mineral Activity, (Table 3-2) assumes the New World Project would be developed. In addition, there is a 10% probability of a surface mine and a 2% probability of an another underground mine. Up to seven mineral exploration operations may occur. Area of likely mineral development is depicted on Map 2-3.

Under this alternative, 17,760 acres of federal land would be excluded from mineral entry; cultural resources on these

acres would escape the impacts associated with mining. In general, the lands immediately subject to the withdrawal are outside the New World Historic District. Much of the federal land within the District has unpatented mining claims, so the withdrawal does not have an immediate effect on these lands.

The integrity and character of setting of the District would likely be affected by future mining including the New World Project. Without the NWM Agreement, unpatented mining claims on federal lands and private land available for mineral development, including the area of highest mineral potential which covers the heart of the New World Historic District. The potential effects of mining would be similar to those outlined under Scenario A-1. Briefly, two of the mine alternatives would directly affect significant prehistoric sites and three other mine alternatives would directly affect significant historic sites to such an extent that the integrity of the District would be destroyed. Other mine alternatives would indirectly affect significant historic sites, reducing the integrity of the Historic District but not destroying it.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented

Under this scenario, 17,760 acres of unclaimed federal land are immediately subject to the mineral withdrawal and up to 1,740 acres of Crown Butte's private minerals and 4,180 acres unpatented mining claims are withdrawn when the NWM Agreement is implemented. Sixty acres of unpatented mining claims and 2,420 acres of private land remain available for mineral development. The Forecast for Mineral Activity, (Table 3-2) assumes no mines would be developed and one exploration operation is possible. Area of likely mineral development is depicted on Map 2-4.

The combined effects of the NWM Agreement and the mineral withdrawal significantly reduce the potential for future mining in the area. The integrity of the New World Historic District and of individual cultural sites would not likely be affected by future mining.

2,420 acres within the study area would remain privately owned and 60 acres of federal land would still be subject to mining claims with valid existing rights. Mineral exploration and development on these 2,567 acres has some potential to affect historic and prehistoric sites on federal land. However, more than half of the private land is outside the New World Historic District. There is some possibility that the character of setting of the District could be impacted by mining activities on these 2,567 acres, but the scale of these potential effects would be quite different from the potential intrusions which might be anticipated under the No Action alternative.

Cumulative Effects Common to Both Alternatives

Reclamation

Reclamation is anticipated under all Scenarios due to reclamation associated with mine development or with the NWM Agreement which includes provisions for reclamation activities on historic mine waste. Cleanup of historic mine waste has the potential to affect qualities important to the historic integrity of many sites. Reclamation would probably include the closing of portals and adits, recontouring of mine wastes, liming and revegetation and perhaps more. These activities would probably be concentrated at sites in the Fisher Creek and Daisy Creek drainages. The Como and McLaren pits would be reclaimed; the Glengarry, Gold Dust, Little Daisy, and other adits would be closed; several prospecting pits in the Fisher Creek and Daisy Creek drainages would be reclaimed; tailings piles in Fisher Creek and Miller Creek drainages would be reclaimed; and abandoned roads on Henderson Mountain would be recontoured. Most of the properties and locations to be reclaimed are significant historic sites or locations so there could be an adverse effect from the reclamation activities. Specific rehabilitation plans would need to be reviewed under the Section 106 process of the NHPA and a treatment plan for the protection of significant historic values developed in consultation with the State Historic Preservation Office and the Advisory Council on Historic Preservation.

Highway Improvements

Several highway improvement projects in the next few years could have cumulative effects on the area, although the effect on cultural resources may not be great. Road improvement in Yellowstone NP may require aggregate sources outside the Park. Aggregate sources are excluded from the provisions of the proposed mineral withdrawal, so even if the withdrawal occurs, aggregate locations may be impacted by gravel extraction. Aggregate locations on federal land would need to be surveyed for the presence of prehistoric and historic sites.

The Federal Highway Administration proposes to improve the Beartooth Highway (U.S. 212) from Yellowstone NP east to the Montana/Wyoming State line. This highway parallels much of the southern end of the Historic District and passes through a southern extension of the District. Inventories of the areas of proposed highway improvements indicate that no cultural sites would be affected by the construction (Walt Allen, personal communication, 1996).

Recreation, Tourism, Population Increases

Tourism in Yellowstone NP grows each year and recreational use of the adjacent federal lands also increases. The extensive network of new and old mining exploration roads in the study area is used year round for dispersed recreation. The effects on cultural resources of recreational activities, such as snowmobiling, trail biking, skiing, and hiking may not be as immediately noticeable as that of mining but the continued increasing pressure of recreational use often causes damage to cultural sites. The cumulative effects, especially if vandalism occurs, could be great. The impacts might be mitigated by a monitoring, signing, and educational effort in the area.

Potential population increases, especially around Cooke City, Silver Gate, and US Hwy 212, could result in the demand for more housing, services and infrastructure. Construction could have an impact on historic structures and prehistoric sites.

Conclusion

The potential future mining which might occur under Scenario A-1 affects significant historic and prehistoric sites in the study area. Also, future actions could affect the integrity of the New World Historic District. Impacts could include physical damage to the sites, impact to the character of the setting of the District and the introduction of visual and auditory elements out of keeping with the District. Future undertakings, including reclamation, would need to be reviewed under Section 106 of the NHPA. Mitigation of potential impacts could reduce or eliminate adverse effects to the integrity of the District and to significant sites. Any loss of these resources, however, would be an irreversible commitment of resources. Scenario A-2 reduces the potential for mining in the heart of the Historic District due to the NWM Agreement. While the integrity of the District as well as individual sites are not likely to be affected by mining, mineral development could occur on the remaining federal and private lands available for mining.

For Scenario B-1, the effects on the Historic District and to individual sites are similar to those described for Scenario A-1. The NWP would be developed and other mines are possible in the heart of the District. Scenario B-2 would have an overall beneficial effect on the District and on significant sites individually by removing the potential of impacts from mining exploration and development. Still, reclamation activities conducted as part of the agreement would need Section 106 review and mitigation of any possible adverse effects. Loss of cultural resources would be an irreversible commitment of resources.

WILDLIFE AND SENSITIVE PLANTS

Introduction

The study area is rich in biodiversity including a wide variety of migratory and nonmigratory species common to boreal forests and higher elevations. The types of species and numbers of animals present is impressive in a comparative sense. The location and physical characteristics of the study area allow for the presence of this diverse collection of wildlife and the habitat niches they require. The study area has few human inhabitants and is adjacent to large expanses of land in an undeveloped state. This provides habitat for animals requiring minimal contact with humans, and/or large, diverse home ranges where movement corridors are intact. Furthermore, the area is adjacent to Yellowstone National Park which is internationally known for its large, free-roaming herds of bison and elk, and endangered species such as the grizzly bear and the gray wolf.

Biodiversity has become an important topic at the national level as well as the local level. Biodiversity, simply stated, is the variety of life and its many processes. The main elements of biodiversity are: natural levels of genetic variations, individual species diversity, biological communities, and the variety of these communities when viewed on a regional landscape scale. The Forest Service is able to play a role in maintaining biodiversity because of the large areas which are managed under Forest Service stewardship. The National Forest Management Act (NFMA) requires that National Forest System lands provide for a diversity of plant and animal communities to meet overall multiple-use objectives.

Issues

Issues relating to biological diversity within the study area that area addressed in this EIS include threatened, endangered, and USFS sensitive species including sensitive plants, USFS management indicator species, and large ungulates including elk, mule deer, moose, mountain sheep, mountain goat and bison. Additional discussion of the effects of alternatives on Yellowstone National Park was included to address concerns identified in public scoping.

USFS Management Indicator Species

The implementing regulations of the NFMA require the Forest Service to plan for the management of wildlife

habitats to maintain viable populations of existing and desired native species in the planning area. To facilitate the management of all species, the NFMA further requires each Forest to identify management indicator species (see glossary and Appendix F) and establish objectives to maintain and improve their habitats. To insure that viable populations would be maintained, habitat must be provided to support at least a minimum number of reproductive individuals, and that habitat must be well distributed so that individuals can interact with others in the planning area (36 CFR 219.29).

In the Gallatin and Custer Forest Plans, management indicator species were identified (Gallatin FP, pg. II-19; Custer FP, pg. 18). They were classified as endangered or threatened, commonly hunted and fished, commonly trapped, special interest, and special habitat needs (old growth or snag dependent). Management Indicator Species (MIS) for the Gallatin and Custer National Forests are listed in Appendix F in this EIS.

Analyses presented in this section emphasize habitat considerations and other factors which are limiting or of greatest management concern related to maintaining population viability of a given species or group of species. For species identified as federally listed threatened, endangered or candidate, or USFS Northern Region sensitive, population viability is a concern because habitat changes could affect individuals of small local populations. For most species that are commonly hunted (game species) or that have widespread stable populations, population viability is not a concern because of their overall abundance. However reductions in habitats considered limiting (winter range) or loss of security habitat (particularly if hunting pressure increases) are management concerns. Larger ungulates that are commonly hunted were included in the analysis.

Threatened and Endangered Species

In accordance with Section 7 of the Endangered Species Act, a request was made to the U. S. Fish and Wildlife Service (USFWS) for a list of federally-listed threatened, endangered and candidate species that should be considered in the Biological Assessment (Appendix E) for the proposed Cooke City Area Mineral Withdrawal (Thompson and Timchak September 4, 1996a; Thompson and Timchak September 4, 1996b). The USFWS responded for Montana (McMaster, September 16, 1996). The Wyoming Field Office concurred with the list supplied by the Montana Field office of the USFWS (Davis, October 30, 1996). The grizzly bear (resident), gray wolf (resident, transient), bald eagle (resident, transient), and peregrine falcon (resident migrant) were identified as the threatened and endan-

gered species that may be present in the study area. No proposed species (see discussion below on the status of the gray wolf) or category 1 candidate species were included. No critical habitat has been designated or proposed in the study area.

On November 22, 1994, the USFWS published final rules in the *Federal Register* designating wolves reintroduced in Yellowstone NP as nonessential experimental populations. Wolves designated as nonessential experimental that are not within units of the National Park or National Wildlife Refuge systems are treated as proposed species for Section 7 purposes (refer to detailed discussion on gray wolf).

Grizzly Bear (Threatened)

Affected Environment

A self-perpetuating grizzly bear population exists within the Greater Yellowstone Area. Because the grizzly bear is a threatened species, the U. S. Fish and Wildlife Service has prepared and implemented a recovery plan for the grizzly bear. The future of the Yellowstone grizzly bear is uncertain and controversial. Trend data indicates the grizzly bear population is increasing following a decline caused by the closure of open garbage dumps in 1970 and 1971, in concert with other factors. It is difficult, however, to determine actual population numbers.

As part of the U.S. Fish and Wildlife Service's recovery plan, parameters were established to facilitate recovery. Although the 1993 Recovery Plan is in litigation and pending settlement, the Plan's parameters provide a means to measure changes in the grizzly bear population over time and determine the recovery ability of the population. Meeting the goals established for these parameters would lead towards population recovery. The recovery goal for allowable known human-caused mortality is not-to-exceed 4 percent of the estimated population, with female mortality not-to-exceed 30 percent of the 4 percent. The population estimate is recalculated annually, therefore fixed numbers were not used here.

The majority of grizzly bear mortalities since 1974 are attributable to human-related incidents, such as shootings and management control actions. Almost half of the mortality risk is associated with people carrying firearms on National Forests. Known and probable grizzly bear deaths tend to be centered around specific areas in and around Yellowstone NP, such as the gateway communities of West Yellowstone, Cooke City, and Gardiner, as well as certain recreational developments, sheep grazing allotments, and other human concentration areas. High mortalities in 1994 and 1995 were in contrast to the declining trend of the previous 10 years.

Study Area. The Management Situation 1 grizzly bear habitat (habitat considered essential for recovery of the species) within the study area is under-utilized by grizzly bears because of present levels of human activity, road densities, and past levels of grizzly bear mortality. The area around Cooke City and Silver Gate is considered a population sink (an area that brings grizzly bears into contact with humans often resulting in removal of bears from the population).

A cumulative effects model has been developed that allows for analysis of human impacts on grizzly bear habitat. Bear management units are the delineation at the broadest level of analysis which in turn are divided into sub-units. The cumulative effects boundary for grizzly bear for this analysis is Lamar Subunit #1 and #2 which generally includes the Lamar River drainage, and Crandall/Sunlight Subunit #1, #2 and #3, which generally includes the Clarks Fork drainage (Tyers, 1996; Figure 24). The portions of the study area that drain into Soda Butte Creek and the Stillwater River are within Lamar Subunit #1. The portion of the study area that drains into the Clarks Fork is in Crandall Sunlight Unit #1.

Mortality/Habituation. The number of human-caused grizzly bear mortalities is positively correlated both spatially and temporally with increased human access and activity, and the resulting increased contact between bears and humans.

Habituated or food-conditioned grizzly bears are much more likely to be killed by humans than bears that remain wary, especially where human activity is relatively unregulated and/or big game hunting is allowed. Habituated bears are proportionately most active and most common near human facilities such as roads, viewing areas, and recreational developments, especially in unhunted populations. Habituated bears are often perceived to be a threat to human safety; consequently, they are typically killed at a higher rate than wary bears. Thus, habituation typically increases mortality risk for individual bears except where human activity is closely regulated and the bear population is unhunted. Ungulate hunters accounted for a large portion of defense-of-life-and-property kills in the Yellowstone ecosystem since 1988. Most illegal kills occurred during the big-game hunting season.

Denning Habitat. Continent-wide, the grizzly bear shows a strong allegiance to denning areas. Grizzly bears in dens are relatively tolerant to disturbances beyond 1 km. Denning areas represent locations where bears concentrate their activities. Denning habitat is not considered to be a factor limiting grizzly bears in the Yellowstone area. Suitable grizzly bear denning habitat exists on high elevation slopes containing dense conifer cover within the cumulative effects study area. These areas include, but are not limited to,

portions of Republic, Woody, Hayden Creek, Cache, Soda Butte to Lamar Valley, and Lady of the Lake Creeks (per. comm, Dan Tyers, USFS, Sept. 10, 1996). Habitat north of Cooke City where logging and fire have removed cover and the road density is high is not suitable for denning (Tyers, D. Jan. 16, 1997).

Hiding and Security. The study area, in contrast with the surrounding areas, has a high road density and high levels of human use. In addition, the quality of the hiding and security cover varies throughout the study area because of past fire and timber harvesting events.

The analysis of affects to grizzly bear habitat is in part based on an assessment of impacts to *core* areas. Core areas are defined as areas where: (1) no motorized use of roads and trails occurs during the non-denning period, and restricted roads require closure devices that are permanent; (2) no roads or trails exists that receive non-motorized, high intensity use as defined in established cumulative effects activity definitions; and (3) a minimum of 0.3 miles (500 m) exists from any open road or motorized trail. Refer to Map 3-17 for the location of core areas, open roads, and high use trails in the study area.

The extent of core area changes seasonally primarily due to seasonal trail use involving hiking, skiing or hunting activities. As recreation use increases, core areas may shrink as a result of the increased human presence. The time of year that core areas are generally the smallest varies with elevation which influences access and the type of recreational activity that may be occurring during that season. The seasons are spring (3/1 through 5/31), summer (6/1 through 8/31), and fall (9/1 through 11/30). The denning season is from 12/1 through 2/29 during which bears are generally not active. During the spring, at the high elevations in the Cooke City area, skiing is the primary form of recreation. During the summer, hiking is the major recreation use on trails. During the fall, hunting outside the Park influences trail use and hiking continues to influence trail use in the Park.

Food/Prey base of the Grizzly Bear. Grizzly bears are opportunistic feeders that use a wide variety of animal and plant food items. Although diet varies as much by season as by month, trends are discernible. The main items in the diet of Yellowstone grizzly bears are whitebark pine nuts, grasses and forbs, and ungulates. Ungulate meat is estimated to be one of the top two sources of energy in the average diet. Carrion scavenged from March through May can constitute a major portion of this ingested meat.

The whitebark pine component of forests is limited in distribution in Montana and is in a declining trend due to stand maturity, susceptibility to pests and the presence of

non-native pathogens such as white pine blister rust. Whitebark pine is generally less common, but provides better forage habitat for grizzly bear and other wildlife than other forest types in the study area. The 26,160 acre study area contains approximately 2,340 acres of mature and 50 acres of immature whitebark pine forest. Whitebark pine forests within the study area are located at high elevations including areas within high elevation mining claims (e.g., Henderson Mountain area). Relatively few acres of whitebark pine burned in the 1988 fires.

Whitebark pine seeds are an important food of grizzly bears. The use of this food by bears is positively associated with fertility and survival of the population. Use of pine seeds by grizzlies is almost entirely contingent upon the presence and behavior of red squirrels. Squirrels typically cache pine cones in middens (refuse heaps) at the base of trees or downed logs. During most years, virtually all (97%), of pine seeds used by grizzly bears are a result of excavations in middens for the otherwise closed cones.

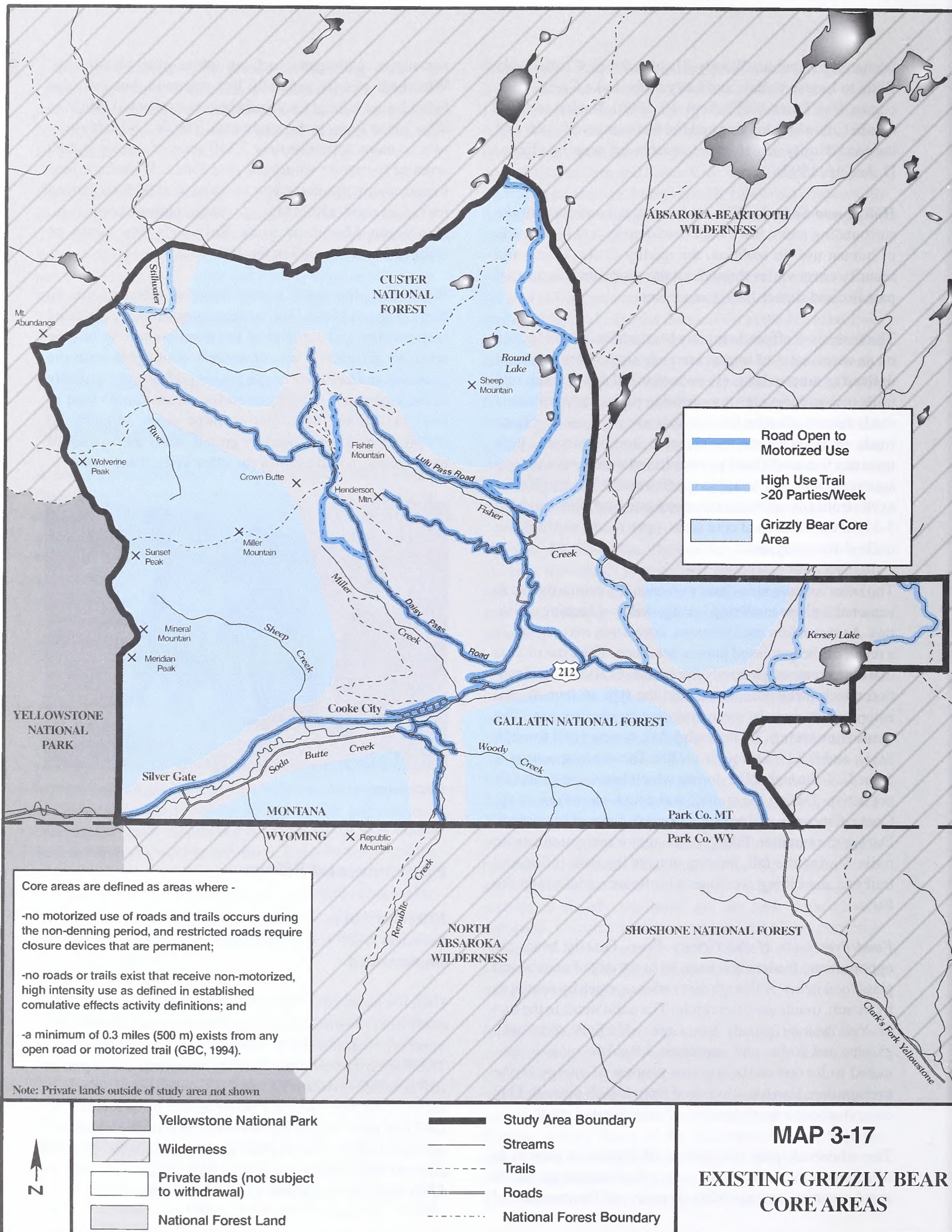


Grizzly bears.

Environmental Effects

Effects of Alternative A, No Mineral Withdrawal, Scenario A-1: New World Mine Agreement Not Implemented.

Under Scenario A-1, all 22,000 acres of federal land in the study area remains open to mineral entry, and up to 4,160 acres of private land is available for mineral development. The Forecast for Mineral Activity which was developed as one possible scenario for analysis purposes (Table 3-2), assumes the New World Project would be developed. In addition, there is a 10% probability of a surface mine and a 2% probability of another underground mine. Up to 10 mineral exploration operations may occur. The area of likely mineral development is shown on Map 2-1.



The 22,000 acres of federal lands remaining available for mineral entry include grizzly bear core areas. As core areas in the Republic Mountain, Reef and Mineral Mountain areas have high potential for mineral development, there is a possibility that additional mineral exploration and development could occur there. Such development could be in conflict with Gallatin Forest Plan Amendment 19 which provides for protection of existing core areas on the Gallatin NF. The general effects of any future development in this area are described below.

This scenario provides for the maximum mineral development potential for the area. The New World Project would be developed and other mines are possible. Habitat at risk from future mineral development include denning habitat, hiding and security cover (core areas), prey base, and whitebark pine. As the human population increases due to mine development, there would be an increased risk of human-caused mortality.

Mortality/Habituation. There is an increased risk that greater numbers of unpredictably dispersed and armed humans will result in higher mortality risk for the population of grizzly bears. Human-caused mortality is considered to be a factor limiting grizzly bear populations. Risk attributable to big-game hunters is disproportionately high because hunters are armed, often dispersed in an unpredictable way across the landscape, and typically associated with animal remains that attract bears.

Increasing local populations related to mineral development may increase the potential for habituated bears. Habituated or food-conditioned grizzly bears are much more likely to be killed by humans than bears that remain wary, especially where human activity is relatively unregulated and/or big game hunting is allowed. Habituated bears are proportionately most active and most common near human facilities such as roads, viewing areas, and recreational developments, especially in un hunted populations. Habituated bears are often perceived to be a threat to human safety; consequently, they are typically killed at a higher rate than wary bears. Thus, habituation typically increases mortality risk for individual bears except where human activity is closely regulated and the bear population is un hunted.

Denning Habitat. Direct impacts of mining-related actions on denning habitat are less likely if mining occurs in roaded, high use areas where the current level of human activity probably precludes use of suitable denning habitat by grizzly bear. The highest mineral development potential coincides with the roaded area of high human activity. If development is concentrated here, direct effects to grizzly bear denning sites would be minimal. However, if exploration and discovery occurs in the grizzly bear core areas like Republic Mountain or Mineral Mountain, there is an increased risk of effects to bear denning habitat.

It is not possible to completely anticipate the potential indirect impacts to denning bears that might be generated in the study area by this alternative, because it is not possible to know where each bear will den during the next 20 years relative to potential mining related actions. Once additional mining related actions were established, the human associated activity would probably discourage bears from denning within a distance of the activity. Grizzly bears, while in dens located outside the area of human activity associated with mining related actions, would probably not be affected.

Yellowstone NP and adjacent Wilderness contain abundant available denning habitat in addition to habitat found within the study area. Denning habitat is not considered to be a factor limiting grizzly bear populations. Increases in human activity within denning habitat could, over time, result in increased human caused bear mortality and could reduce grizzly bear populations.

Hiding and Security. Vegetation clearing for mining-related actions could result in direct loss of forested habitats and could potentially reduce hiding and security cover. Reconstruction or construction of roads could result in motor vehicle access to previously unroaded areas and reduce security for grizzly bears.

There is an increased risk of overall mortality if miles of open roads and numbers of town-sites or major recreational developments increase in occupied grizzly bear habitat areas. If mining-related actions occur in existing high road density areas there would be minimal direct impact on grizzly bear core areas. If mining-related actions, however, occur in unroaded areas, there could be reductions in grizzly bear core areas. High open motorized access route density is defined as greater than 2 miles/square mile for open motorized access routes. Mitigation could help limit open road densities. Mining-related actions in the vicinity of trailheads could result in indirect impacts or shift recreation activity into currently unroaded areas currently functioning as core areas. A reduction in core areas would tend to increase human-grizzly bear interactions which would tend to lead to increased bear habituation and mortality.

One measure of potential impacts is the range of projected impacts from the New World Project (NWP PDEIS, Wildlife Technical Report, P. 64; 6.3.3). Increasing recreation use on trails results in a decrease in grizzly bear core area when the use exceeds 20 parties per week. Changes from low use to high use trails would most likely occur closest to housing facilities, trailheads and new roads because of increased human population growth associated with mining. Some low use trails may increase to a high use category immediately as opposed to a change from low to high over a longer period of time without a mine. The actual impacts

from a new mine would depend on the location of mining-related actions in relation to a core area. Increases in recreational activity may occur without a mine due to expected trends for visitation in the Greater Yellowstone Area.

The core areas of the Crandall/Sunlight subunit #1 and Lamar subunit #1 would be the most affected by the mine (NWP PDEIS, Wildlife Technical Report, Table 8, Figure 11). In the Crandall/Sunlight subunit #1, core area would be reduced by 12 percent in the summer (from 59 to 47 percent) and by 16 percent in the fall, due to anticipated increases in human presence in existing core areas. The year average core area would be reduced by 8 percent. The core area would not change in the spring. In the Lamar sub-unit #1, the core area would decrease by about 9 percent in the spring, summer, and year from about 89 to 80 percent. The fall core area would decrease by about 4 percent.

The core areas in Crandall/Sunlight sub-unit #2 would decrease slightly in the spring (2 percent), with decreases of 3 to 4 percent in the summer and fall. The core area of Crandall/Sunlight sub-unit #3 and Lamar sub-unit #1, which are further from the mine area, would decrease by less than 1 percent over all seasons. The impacts on core areas from additional mineral development would vary depending upon the location and size of future mineral development activities.

The interim standard under Gallatin Forest Plan Amendment No. 19, February 1996, is to allow no increase in open motorized access route density or total motorized access route density in core areas unless allowed through consultation with the USFWS. A decrease in core areas could lead to a site-specific amendment to the Gallatin Forest Plan, and/or mitigation as determined by the USFWS.

Food/Prey Base. There would be an increased risk that the whitebark pine component of the forest could be removed from mining-related actions. One measure of potential impacts is the range of projected impacts from the New World Project which vary from approximately 3 to 128 acres of old growth whitebark pine lost based on the alternatives considered in detail (NWP PDEIS Wildlife Technical Report, Table 10, P. 80). These areas would vary for other mines depending on acreage for each mine and the portion of the mine within or outside of old growth whitebark pine stands. In addition to trees, the removal of vegetation could have an effect on the local berry, tuber, and other plant related potential grizzly bear food items.

Mining related population increases could lead to an increase in hunting pressure which could affect grizzly bear prey species. Higher hunter harvest, potentially affecting the number of ungulates in the area, may not occur however.

Harvest of bighorn sheep, mountain goat, and moose is restricted to permit hunting only. For example, the number of the moose hunting permits available is seven. The number of permits for these species will not increase because of an increase in interest. Harvest of elk and mule deer in the area has never been high and would not be expected to increase appreciably.

Yellowstone National Park. Plowing of snow on US 212 east of Cooke City would increase human access into the Park during the winter. This would create minimal risk to bears because they would be in their dens hibernating. There would be an increased risk of human-caused mortality during the late winter as well as the non-denning season. Increasing local populations and mineral development could result in additional bear mortality, potentially affecting the bear population in the Greater Yellowstone Area which includes Yellowstone NP.

Effects of Alternative A, No Mineral Withdrawal, Scenario A-2: New World Mine Agreement Implemented.

Under Scenario A-2, 17,820 acres of federal land remain available for mineral entry. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would not be available for mining. The Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes there is a 2 percent probability of an underground mine and the potential for up to 5 exploration operations. The area of likely mineral development is shown on Map 2-2.

While mining could still occur on the 17,820 acres available for filing of new mining claims, the NWM Agreement removes the area of highest potential from future mining. The likelihood of other large mines is greatly reduced. The risks associated with increasing human population and loss of secure habitat are substantially reduced. Federal lands that remain available for mineral entry consists primarily of undeveloped lands including grizzly bear core areas. As core areas in the Republic Mountain, Reef, and Mineral Mountain areas have high potential for mineral development, there is a possibility that additional mineral exploration and development could occur there. Such development could be in conflict with Gallatin Forest Plan Amendment 19 which provides for protection of existing core areas on the Gallatin NF. If a major mine is developed on lands open to mining, effects would be similar to those described for Scenario A-1, depending upon the size and location of future mines.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-1: New World Mine Agreement Not Implemented.

Under Scenario B-1, 17,760 acres of federal lands are immediately subject to the mineral withdrawal. 4,160 acres of private land and 4,240 acres of existing unpatented mining claims remain available for mineral development (Map 2-3). The Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes the New World Project would be developed. In addition, there is a 10 percent probability of a surface mine and a 2 percent probability of another underground mine. Up to seven mineral exploration operations may occur. Up to 10 mineral exploration operations may occur. Area of likely mineral development is depicted on Map 2-3.

The immediate effect of the mineral withdrawal is on 17,760 acres of National Forest land which includes most of the identified grizzly bear core areas within the study area. While the withdrawal tends to physically protect the core areas from mineral development, effects from mining on private land and unpatented mining claims in the central portion of the study area are likely to be similar to those described for Scenario A-1.

Effects of Alternative B, Mineral Withdrawal Implemented, Scenario B-2: New World Mine Agreement Implemented.

Under Scenario B-2, 17,760 acres of unclaimed federal land are immediately subject to the mineral withdrawal. Interests acquired under the NWM Agreement including up to 1,740 acres of private mineral estate and 4,180 acres of unpatented mining claims would be withdrawn when the NWM Agreement is implemented. Sixty acres of unpatented mining claims and 2,420 acres of private land remain available for mineral development (Map 2-4). The Forecast for Mineral Activity, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes no mines would be developed and 1 exploration operation is possible. Area of likely mineral development is depicted on Map 2-4.

The New World Mine Agreement, combined with the mineral withdrawal, limits future mining to 60 acres of existing unpatented mining claims and to 2,420 acres of private land. The area of highest mineral potential is largely unavailable for future mining. The forecast for mineral development predicts no major mines and limited exploration. Under this Scenario, changes to habitat and increases in the human population due to mining are not anticipated.

Mining-related activities are not likely to affect suitable denning habitat, grizzly bear hiding and security areas, and

forested habitats including whitebark pine. Reconstruction or construction of roads that could result in motor vehicle access to previously unroaded areas and reduce security for grizzly bears are not likely to occur as a result of mining. Core areas would remain at about current levels if mining related actions are limited to exploration for small mining operations. The potential for human/grizzly bear conflict will remain, but human presence in the area will not increase due to mine development. Based on a projection of recreation use trends, it is estimated that some low use trails may increase to a high use category in approximately the next 10 years as opposed to almost immediate changes with establishment of a major mine.

Gray Wolf (Experimental Population)

Affected Environment

Historically the former range of the Northern Rocky Mountain subspecies of the gray wolf extended from Canada into the northern two-thirds of Wyoming. In the early days of Yellowstone NP there was a government-sponsored program to eliminate wolves. Nationally the interest was to preserve livestock, but locally this was done in deference to ungulates. In recent years, gray wolves have been reported in the Yellowstone NP area, but sustained pack activity in the vicinity has not been documented for years. At this time there is no ongoing pack activity in the vicinity of the study area, though wolves may occasionally pass through the study area (pers. comm., Joe Fontane, USFWS, October 28, 1996 and January 22, 1997. As of January 1, 1997), at least three wolf packs reside in the Lamar Valley in Yellowstone NP just west of the study area (pers. comm., Mary Hektner, Yellowstone NP, NPS, Jan. 14, 1997).

The Yellowstone Ecosystem has been designated as a recovery area for the gray wolf. It has been estimated that Yellowstone NP's northern winter range could support about 75 wolves or about nine packs. The Park could also overlap with the territories of an additional three to four packs. The study area could include portions of one or more territories of these packs.

Recent re-introductions of the gray wolf in Yellowstone NP raises the potential of possible project effects on wolf populations. According to 50 CFR Part 17 (November 22, 1994), the reintroduced wolves in Yellowstone NP are classified as a "nonessential experimental" population according to Section 10(j) of the Endangered Species Act (ESA). "Nonessential experimental" animals located outside national wildlife refuges or national park lands are treated for purposes of Section 7 of the Act, as if they were only proposed for listing (50 CFR Part 17). In other words, although the wolf is an endangered species, it is treated on

federal lands as if it were proposed for listing. According to 50 CFR Part 17, there are no conflicts envisioned with any current or anticipated management actions of the FS or other federal agencies, and management of wolves in the experimental population would not cause major changes to existing private or public land use restrictions. Land use restrictions on public lands could be used, however, to control human intrusion of den sites when fewer than six breeding pairs exist within the experimental area.

Gray wolves are wide-ranging and their distribution is tied primarily to that of their principal prey (elk, bison, moose, etc.). Key components of wolf habitat are considered to be: (1) a sufficient, year-round prey base of ungulates (big game) and alternate prey, (2) suitable and somewhat secluded denning and rendezvous sites, and (3) sufficient space with minimal exposure to humans. Key summering areas for ungulates, especially elk, are considered to be of particular importance in managing for wolf recovery. During winter periods, deer, elk, and moose continue to represent principal prey items for wolves and wolf distribution is keyed to the winter ranges of these species. In Yellowstone NP, an established wolf population was predicted to prey on ungulates in the following decreasing order of importance: elk, bison, mule deer, moose, pronghorns, and bighorns. Potential wolf use of the study area would coincide with the presence of ungulates on seasonal ranges.

Summary of Effects

Mining activities in the study area are not likely to affect wolf denning habitat due to the high elevation of the area. Mining activity at lower elevations within the cumulative effects area and activities along the powerline corridor might occur near and adversely affect wolf denning areas. The study area could receive some year-round use by wolves dispersing from Yellowstone NP or an established pack's territorial activities. Of the larger mammals in the area, wolves are expected to be the least affected by human activities. Researchers have found that wolves were generally not disturbed by humans further than 0.5 mile in open areas and 0.25 mile in forested areas. Studies of moose, caribou, grizzly bear, and wolf responses to exploration and aircraft activity indicated that wolves appeared the least disturbed and showed evidence of habituation. Mining related actions could adversely displace individual animals, but would not have any adverse effect or limit the viability of introduced or naturally dispersing populations of gray wolf. Increased human presence could result in illegal kill of animals from firearms or from vehicle collisions with wolves on highways. There is an increased risk that prey/vehicle collisions on snowplowed sections of highway may attract wolves into the snowplowed highway corridor. Wolf mortality may result from wolf/vehicle

collisions as a result of snowplowing and subsequent snow berms and increased motor vehicle traffic on currently unplowed segments of highway.

The immediate effect of the mineral withdrawal is on 17,760 acres of federal land that would no longer be available for mineral entry (Scenario B-1, B-2). The withdrawn land is contiguous to surrounding wilderness and Yellowstone NP, providing relatively secure habitat for wolves as well as prey species. The potential for mining-related effects to pack activities, denning habitat, or principal prey species would be low. See related discussion on potential prey of gray wolf under the sections on Moose, Elk, Mule deer, and Bison.

Mining-related disturbances are expected to be minimal under Scenario B-2. The potential expansion of wolf packs into this area would not be adversely affected by mining-related impacts.

Bald Eagle (Threatened)

Affected Environment

Bald eagles are residents and winter visitors in Yellowstone NP and the surrounding Yellowstone ecosystem. The Yellowstone ecosystem and the analysis area lie within the Greater Yellowstone Recovery Zone. Suitable bald eagle nesting habitat might occur within the study area and powerline analysis areas. Foraging habitat is present, including Lake Abundance. Bald eagles are occasionally seen at the larger lakes during the summer, but there are no known nest sites. Recreational activity at lakes as well as the high elevation and late ice-free season renders these sites relatively unsuitable as nesting habitat. Bald eagles may also occasionally wander over the powerline corridor, especially near the Clarks Fork River and in the vicinity of Swamp Lake. Disturbance might occur to bald eagle foraging within the study area and potentially to bald eagle nesting habitat within the powerline corridor.

Summary of Effects

As suitability of the study area for nesting is low due to the high elevation of the area lakes. Future mining is not likely to affect bald eagle nest sites. Connected actions including powerline construction and snowplowing additional highway for mining-related actions associated with the NWP area could occur in areas of suitable nesting or foraging habitat for bald eagles. Construction of powerlines to facilitate mining related actions might adversely disturb nesting bald eagle or adversely affect foraging habitat located outside of the study area. Construction of a powerline is a

short-term project; effects to nest sites could be mitigated by timing. Additional mining-related traffic and opening an additional winter access to Cooke City would result in vehicle/ungulate collisions. There is an increased risk that eagles attracted to the carrion could die as a result of collisions with vehicles.

Scenario B-2 reduces the risk to bald eagles because snowplowing and powerline construction are not likely to occur. Scenario B-1 would result in less potential disturbance around study area lakes as they are withdrawn from mineral entry. However, mining in the central portion of the study area would likely require the new powerline and snowplowing US 212. Under Scenario B-2, existing habitat and prey base for bald eagles would not likely change as a result of mining.

Peregrine Falcon (Endangered)

Affected Environment

The peregrine's preferred nest site is a rugged, remote cliff (100 to 300 feet in height) usually overlooking water or marshy areas where prey is abundant. Preferred hunting areas include cropland, meadows, river bottoms, marshes, and lakes that attract abundant bird life. Peregrines may travel up to 17 miles from nesting cliffs to hunting areas. Peregrine falcons are considered uncommon in Yellowstone NP, but nesting has been documented. Recent reintroduction efforts have increased the number of nesting pairs within the Greater Yellowstone Ecosystem. There are abundant suitable cliff nest sites in the study area, but much of the area is still covered with deep snow during the nesting season and is not considered attractive to nesting peregrines. Dispersing or transient birds may occasionally fly over the study area.

Summary of Effects

Mining-related actions in the study that generally occur at high elevations would not disturb or occur near suitable nesting or foraging habitat for peregrine falcon. Construction of powerlines to facilitate mining related actions might adversely disturb nesting peregrine falcons or adversely affect foraging habitat located outside of the study area, but these effects can be mitigated if a nest site is discovered. Snowplowing of additional segments of highway would not affect the peregrine falcon. The benefit of the mineral withdrawal and the NWM Agreement are minimal due to the slight risk future mining presents to peregrine falcons.

USFS Northern Region (R-1) Sensitive Species

Sensitive species are those plant and animal species identified by the Regional Forester for which population viability is a concern as evidenced by significant current or predicted downward trends in population numbers or density, or significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution (USDA, 1989).

Determinations of effects are displayed by species and alternative in Table 3-22. Determination of effects to USFS Northern Region sensitive species included consideration of direct, indirect, and cumulative effects (past, present, and reasonably foreseeable).

As wolverine and lynx are present in the study area, and these species are particularly susceptible to habitat alteration and are sensitive to human activity, a discussion of the affected environment and environmental effects for these species follows. For a detailed discussion of the habitat requirements and the potential effects to other sensitive species listed above, refer to the NWP PDEIS, Wildlife Technical Report.

Wolverine (USFS Sensitive)

Affected Environment

Wolverines are wide ranging and exist in low densities in large roadless or isolated areas. Wolverines prefer rugged, relatively inaccessible mountainous areas at the high elevations in the summer and move to lower (but still snow-bound) elevations in the winter. Seventy percent of all relocated animals were found in large areas of medium or scattered mature timber. Edge areas between habitats, small timber pockets, and rocky, timbered benches accounted for the remainder of the relocation sites. Subalpine fir was the predominant timber type selected by wolverines. One conclusion of a study was that wilderness or remote country where human activity is limited appears to be essential for the maintenance of viable wolverine populations. Food availability is believed to be a primary factor in determining movement patterns and home ranges for wolverines. The scavenging life-style of wolverines results in seasonal long movements and relatively large home ranges. Wolverine have been recorded in Yellowstone National Park in recent years, but the actual status and range of this species in the Greater Yellowstone Ecosystem remain uncertain. Wolverine sightings and sign have been reported within the study area.

TABLE 3-22: USFS NORTHERN REGION SENSITIVE ANIMALS SPECIES PRESENT, CONCLUSION OF EFFECTS FOR ALTERNATIVES CONSIDERED IN DETAIL (WITH THE NWM AGREEMENT) ¹

Common Name	Alternative A (No Action)	Alternative B (Proposed Action)
Townsend's big-eared bat, Wolverine, Lynx	Insufficient data to make a determination of effects.	May impact individuals, but is not likely to cause a trend to federal listing or loss of viability.
Spotted bat, Common Loon, Harlequin Duck, Boreal Owl, Black backed woodpecker	May impact individuals, but is not likely to cause a trend to federal listing or loss of viability.	May impact individuals, but is not likely to cause a trend to federal listing or loss of viability.

¹ USFS Northern Region (R-1) sensitive species (Risbrudt, 1994). USFS Northern Region sensitive animal species absent from the study area were not included in this table.

Summary of Effects

Future mining may affect wolverines by direct loss of habitat, increased human disturbance, or increased trapping mortality due to increasing human populations and improved access. Under Scenario A-1, there is an increased risk that mining-related activities could affect the foraging area of wolverines in the study area. Wolverine foraging areas could include sub-alpine fir areas containing snowshoe hare, carrion sources, and big game winter ranges.

Mortality through incidental trapping is considered the principal threat to populations of wolverine. The trapping season coincides with the winter months when furbearer pelts are at their prime. Although the extent of trapping is unknown, trapping activity in the area of a major mine is assumed to be relatively minor due to the general lack of preferred habitats of furbearers targeted by trappers. Improved winter access to the area and the increase in local population could result in increased trapping. The State of Montana has the authority to regulate trapping in the area.

Scenario B-2 substantially reduces the likelihood of a major mine development and the resulting effects associated with increased disturbance, increasing human population, and improved access. The risk of adverse effects to wolverine and their habitats is reduced. The risk is reduced to a lesser extent with Scenario B-1. While much of the roadless habitat is not available for mining and would continue to provide habitat for wolverines, the anticipated development in the central portion of the study area would lead to effects similar to those described above.

Lynx (USFS Sensitive)

Affected Environment

Lynx are found in suitable habitats in the Rocky Mountains as far south as Utah. Lynx habitat is generally described as climax boreal forest with a dense undercover of thickets and windfalls. Advanced successional stages of forests and dense conifer stands often are preferred habitats of lynx. Denning habitat is characterized as mature lodgepole pine and old-growth (150-250 years old) Engelmann spruce and subalpine fir stands (1 to 5 acres in size) interspersed with other cover types. Large amounts of woody debris are important for denning sites. Lynx feed in young forests, especially where their primary prey, snowshoe hare, is abundant. Suitable lynx habitat in the study area includes mature and old growth forested areas for den sites and young forests (sapling and older stands) for feeding. Unsuitable habitat includes recently burned areas (crownfires), recently clearcut areas, and areas above timberline.

Summary of Effects

Future mining may result in removal of mature lodgepole pine and spruce-fir habitats in the study area. One measure of potential impacts is the range of projected impacts from the New World Project which ranged from approximately 4 to 37 acres loss of mature lodgepole pine and spruce-fir forest based on the alternatives considered in detail in the NWP PDEIS, Wildlife Technical Report (P. 83, Table 11). These acres would vary for other mines depending on the size and location of future activity. If a powerline is constructed into Wyoming, lynx denning habitat (mature forest) would be converted to grass/shrub/sapling dominated

vegetation for the next 20 years. One measure of potential impacts of a powerline is the range of projected impacts from the New World Project which ranged from approximately 169 to 180 acres loss of mature lodgepole pine and spruce-fir forest based on the alternatives considered in detail in the NWP PDEIS, Wildlife Technical Report (P. 83, Table 11). The potential effects of increased human population, access roads for trappers and trapping mortality previously discussed under Wolverine would also apply to lynx.

Under Scenario B-2, existing lynx habitat and levels of trapping would not likely change as a result of future mining. The risk is reduced to a lesser extent under Scenario B-1. While much of the roadless habitat is not available for mining and would continue to provide habitat for lynx, the anticipated development in the central portion of the study area would lead to effects similar to those described above for No Action.

USFS Northern Region Sensitive Plants

Affected Environment

USFS sensitive plants (Risbrudt, C., June 10, 1994) were considered in the analysis (Table 3-23). Additional background information is contained within Vegetation Chapter NWMPDEIS. Present knowledge of sensitive plant species and distribution allows for only vague predictive capability for potential sensitive plant habitat. The animal species that pollinate the sensitive plants are generally not known. Watch plant species were identified (Shelly, S. July 28, 1994), and were considered indirectly through the analysis of sensitive plants. There is no USFS requirement to address Watch or Natural Heritage Program (NHP) Special Interest Species in the biological evaluation (pers. comm., S. Shelly, USFS, October 28, 1996).

The following species, considered rare by Montana NHP, were considered indirectly under biodiversity in this analysis, but are not addressed in the analysis of sensitive species, because they are not currently designated as such by the USFS Northern Region: alpine nerved sedge (*Carex neurophora*), narrow-winged sedge (*Carex stenoptila*), Austrian whitlow-wort (*Draba fladnizensis*), and small-flowered pennycress (*Thlaspi parviflorum*). These species were not detected in surveys in the study area.

Summary of Effects

In general, for a mineral withdrawal analysis where there is no site specific development proposal, there is insufficient data to make a determination of effects. Sensitive plant surveys are completed prior to surface disturbing activities on federal lands. Impacts to sensitive plants can often be

mitigated by relocating surface disturbing activities. With future development, there is an increased risk that USFS Northern Region sensitive plants may be affected. With the mineral withdrawal, the risk is reduced on 17,760 acres in the short term, and up to 22,000 acres in the long term when the NWM Agreement is implemented.

Relatively small known populations could generally be avoided. Some large populations occurring at the sites of proposed mines could be impacted. Populations not detected in surveys could be impacted. The populations of plant species for which plant habitat and associated plant pollinators is well known would have a higher probability of being protected than would species for which habitat is not well known. In general, regulations protecting wetlands would also tend to protect sensitive plants occurring in those habitats. Protection for USFS Northern Region sensitive plants does not apply to, nor would surveys be required on private lands.

Sensitive or rare plant species in the area are characterized by small isolated populations which often occupy microsites. Maintenance of viability of sensitive species requires protecting the known populations and sites or habitats they are capable of occupying under colonization. Ground disturbance and alterations in light, moisture, and nutrient regimes within forest and grasslands can affect sensitive plants and their habitats. These effects can take two forms: either the actual destruction of individuals in a population, or the adverse modification of indicator habitat considered critical to the maintenance of viable populations.

Management activities would differ in their intensity of impact on sensitive plants within the study area. Road and mine site construction would have the greatest effect on sensitive plants, since the existing populations and habitat within the road clearing limits would be physically altered and in most cases removed.

Chemical changes in ground water could impact sensitive plant populations, especially those in moist soil environments. Sensitive plant tolerance to changes in soil acidity, heavy metals, or toxins is generally unknown. The tolerance of pollinators of sensitive plants to these chemical changes is also unknown.

Management activities and their effects on sensitive plant species can be both long and short-term. Activities that occur once on a specific population may not affect the population or its habitat, while repeated activities have the potential to significantly impact the population. Activities prescribed by the alternatives may have cumulative effects on species viability if individual effects occur over a wide geographic range or on large numbers of sensitive plant populations.

**TABLE 3-23: USFS NORTHERN REGION (R-1) SENSITIVE PLANTS
POTENTIALLY PRESENT IN THE STUDY AREA¹**

COMMON NAME	SCIENTIFIC	STATE STATUS ²	PRESENCE
Pink agoseris	<i>Agoseris lackschewitzii</i>	G3/S2	Seeps and springs. Present in study area.
Large-leaved balsam root	<i>Balsamorhiza macrophylla</i>	—	Not detected in surveys in the study area. Potentially present.
Slender paintbrush	<i>Castilleja gracillima</i>	G3G4-/S1	Present in study area.
Parrot head indian paintbrush	<i>Castilleja longispica</i>	—	Not detected in surveys in the study area. Potentially present
Hiker's gentian	<i>Gentianophysis simplex</i>	—	Not detected in surveys in the study area. Potentially present.
Northern rattlesnake plantain	<i>Goodyeara repens</i>	—	Not detected in surveys in the study area. Potentially present.
Discoïd goldenweed	<i>Haplopappus macronema</i> var. <i>macronemea</i>	—	Not detected in surveys in the study area. Potentially present.
Hall's rush	<i>Juncus hallii</i>	G4G5-/S1	Montaine to supalpine, moist to dry meadows and slopes. Not detected in surveys in the study area.
Wolf's willow	<i>Salix wolfii</i> var <i>wolvii</i>	G4-/S1	Wetlands including seeps and springs. Present in study area

¹ USFS Northern Region (R-1) sensitive species (Risbrudt, 1994). USFS Northern Region sensitive species determined to be absent from the study area were not included in this table. The proposed Cooke City Area Mineral withdrawal is entirely within USFS Northern Region (R-1) and does not extend into the USFS Rocky Mountain Region (R-2) in Wyoming.

² Natural Heritage Program rankings on a State (S) and Global (G) basis. G1/S1 = Critically imperiled in State (S1) or globally (G1) because of extreme rarity and especially vulnerable to extirpation; G2/S2 = imperiled in state (S2) or globally because of rarity or vulnerability of extirpation; G3/S3 = rare in state or very rare and local throughout its range globally; G4 = apparently secure globally though it may be quite rare in parts of its range; G5 = Demonstrably secure globally, may be quite rare in parts of its range.

Population size, associated habitat and topography along with the intensity, duration, and timing of the proposed activity were considered in determining effects to sensitive plants. On federal lands, site specific impacts and avoidance would be considered on a site specific basis at the time of mining application. At the mine application level, a biological evaluation is required as a condition for approval of a surface use plan on federal lands. A sensitive species survey(s) may be required to complete the biological evaluation. The inclusion of sensitive plants in the Northern Region Sensitive Species list and respective surveys to detect these plants has primarily occurred after 1989. There is limited written monitoring data from which to make projections of effectiveness of mining mitigation measures on sensitive plants, populations, or potential habitat. Past surveys have generally focused on undisturbed areas and have generally not included areas that have been affected by

mining related actions. Surveys in areas of past mining related actions detect only plant populations that survived impacts. The effect of alternatives on the habitat of pollinators of sensitive plants is unknown.

Determination of Effects

Determination of effects for Scenario B-2 for sensitive plant species would be, "may impact individuals, but is not likely to cause a trend to federal listing or loss of viability" (MIIH) for all sensitive plant species potentially present in the study area. While the effects of the mineral withdrawal would be "no effect," the potential for effects from abandoned mine reclamation and associated actions as part of the New World Mine Agreement would be MIIH. There is insufficient site specific information to make a determination of effects for other alternative(s) considered in detail

(Scenarios A-1, A-2, and B-1). Determinations of effects are based on USFS Form 2 (R-1-2670-95) initially determined by Donald C. Sasse, USFS Wildlife Biologist, and reviewed and approved by Steve Shelly, USFS Northern Region Botanist, January 23, 1997.

Other USFS Management Indicator Species Or Identified Sub-Issues

Several other MIS species, in addition to those previously mentioned, are discussed in this section. Refer to Appendix F for a complete list of MIS.

Moose (Sub-Issue)

Affected Environment

Population Trends. The Shiras moose in the mountains of Wyoming and Montana is thought to be generally stable or slowly increasing throughout this area. However, some big game specialists consider moose populations in the inter-mountain west to be fairly fragile; numbers are usually small and their habitat (riparian areas and older forests) is especially vulnerable to human encroachment. Moose populations are often hard to survey and definitive statements on numbers and trends can be difficult to make, which hampers management efforts. Moose are thought to have declined across the northern Yellowstone winter range and surrounding areas due to the effects of a major fire event in 1988. The moose population in the study area is estimated at 25 to 50, which represents one of the larger concentrations of this species in the northern part of the Greater Yellowstone Area.

Habitat Selection. In the Yellowstone region, mature and old-growth spruce-fir and lodgepole pine cover types were the most frequently used habitats by moose from November through April (Tyers, 1990). During late spring, summer, and fall, moose are usually found along stream bottoms and in moist meadow areas in mid-to-high elevation coniferous habitats, although they can be found at most elevations during these seasons. Upland spruce-fir and aspen stands are also heavily used habitats.

The best habitat for moose in the Cooke City Basin consists of willow communities/moist meadows and areas with mature conifers (older lodgepole, subalpine, and Douglas fir forests). Older forests are used during all seasons and provide several important habitat components: hiding and thermal cover, an understory of subalpine fir seedlings and saplings for winter browse, and canopies that ameliorate snow conditions as well as summer heat. Moose frequent

willow communities during the summer, fall, and early winter to browse on shrubs but are often excluded from them by snow during mid and late winter. Moose winter range within the study area is shown on Map 3-18.

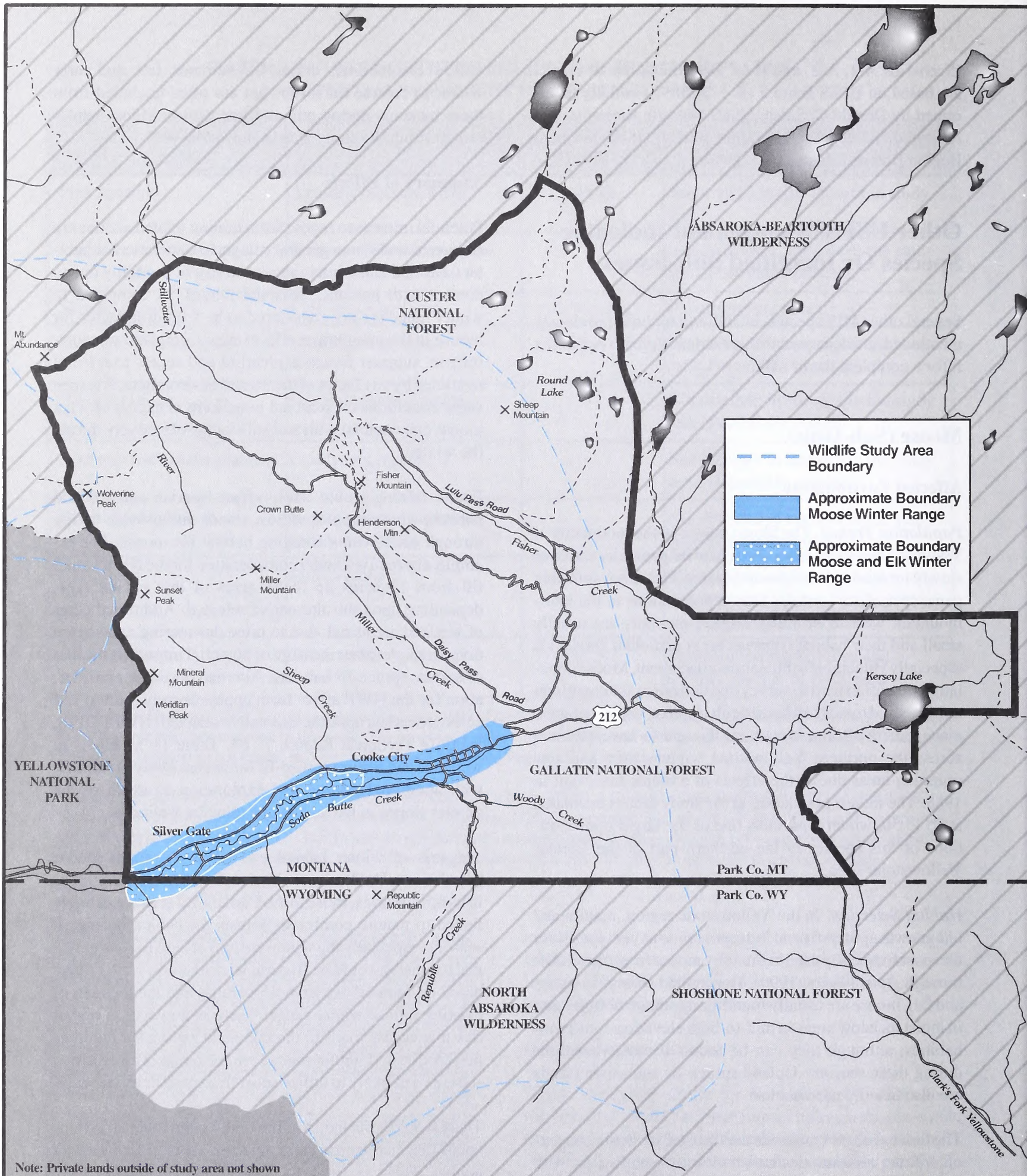
Summary of Effects

Potential impacts to moose from mining related actions are discussed under two general categories: alteration of habitat (seasonal and winter range) and risk of mortality due to contact with humans. Seasonal ranges, as compared to winter range are not considered to be a limiting factor for moose in the cumulative effects area. Compared to winter browse, summer forage is plentiful and access to it is not restricted by any factor of the natural environment. Average snow conditions on seasonal ranges are in excess of what moose can contend with and still forage effectively during the winter.

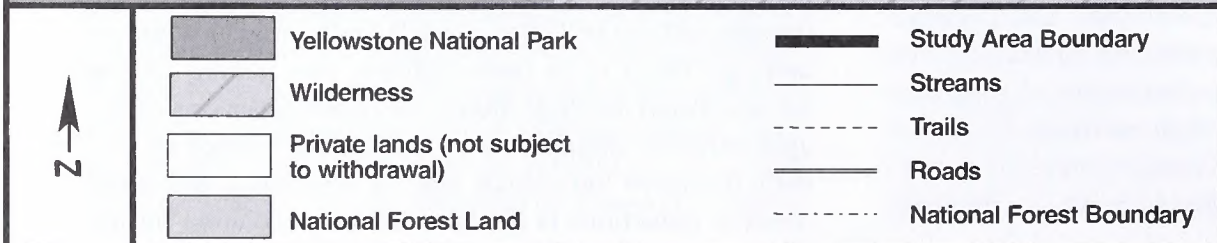
Future mining would likely affect riparian and wetland habitats which support willow stands and provide spring through early winter foraging habitat for moose. For example, alternatives under consideration for the NWP would fill from 18 acres up to 81 acres of this habitat type, depending upon the alternative selected. Additional acres of wetland are at risk due to mine dewatering and stream diversions. Another measure of potential impacts is the loss of mature spruce-fir habitats. Alternatives under consideration for the NWP affect from approximately 5 up to 134 acres depending upon the alternative selected (NWP PDEIS, Wildlife Technical Report, P. 83, Table 11). Effects to wetlands and mature spruce-fir forests are likely to increase with additional mining and exploration as much of the gentler slopes in the area is occupied by wetlands.

The loss of winter habitat can adversely affect moose populations. Unlike moose in many other geographic areas in North America, those in the Cooke City area are strongly linked to mature coniferous forests for habitat during all seasons; especially the winter months. There is a lower risk that a mine(s) would be situated within moose winter range based on mineral occurrence potential and the location of existing moose winter range. There is however, a higher risk that access roads to the mine and associated facilities may be located within moose winter range. Moose are to some extent likely to utilize snow free roads as travel ways.

There would be an increased risk that mining related actions could displace moose from adjacent areas of undisturbed habitat. There is a risk that moose may generally avoid habitats within 1 to 2 kilometers (0.6 to 1.2 miles) of human activity. There is an increased risk that mining related actions would preclude moose use of habitats along drainages currently unimpacted by human disturbance and locally displaced individuals may be eliminated and could result in reductions in the local moose population for the



Note: Private lands outside of study area not shown



MAP 3-18
ELK AND MOOSE
WINTER RANGE

next 20 years. Although moose hunting is strictly controlled by permit, illegal harvest may increase with increases in the human population.

It is estimated that at a minimum, Highway 212 and the access roads to each mine would be kept open in the winter. Vehicle collisions with moose are more likely to occur with increased removal of snow from roads and increased travel by motor vehicles on moose winter range. Moose may seek relief from snow conditions and use the plowed surfaces, dispersing to formerly inaccessible areas along the corridors created. The snowplowed corridors could result in increased risk of encounters between moose and vehicles that are energetically very expensive for moose as they attempt to out run the vehicle or climb out of the road cut and into deep snow.

Statistics for Highway 191 on the northwestern boundary of Yellowstone NP provide an indication of potential moose mortality from vehicle collisions. Highway 191 and US 212 are similar in that both are in high snow fall areas where deep road cuts are created with plowing, and they both traverse moose summer and winter range. It is approximately 11 miles from Cooke City to the junction with Highway 296. Based on an average of 0.22 moose killed per mile annually on Highway 191 over a 30-year period, a direct application to Highway 212 would equate to approximately 2.42 moose killed per year ($0.22 \text{ moose/mile} \times 11 \text{ miles Cooke City to the Highway 296 junction}$). These rates could vary considerably based on the frequency and duration of vehicular traffic, type of vehicle, snow plowing to provide escape routes for moose, recreation use, and density of moose in the area.

The powerline corridor would traverse portions of moose winter range and preferred crucial winter range at the lower elevations where it parallels the Clarks Fork. Human disturbance and habitat conversions associated with powerline construction would not have any measurable effect on moose populations. Tree clearing along the transmission corridor would result in minor increases in foraging habitat in portions of winter and summer range traversed by the line.

The alternative would not result in an increase in legal harvest because hunting is restricted to a specific harvest quota as determined by the Montana Department of Fish, Wildlife and Parks (MDFWP). Increased use and access of the area may result in additional harvest due to accidental shootings or illegal harvest.

Scenario B-1 eliminates the potential for mining-related impacts on at least 17,760 acres of federal land. Existing habitat and levels of access are not likely to change as a result of mining. However, effects related to increased

traffic, snowplowing, and increased human population as well as habitat alteration as described for Scenario A-1 would occur due to anticipated mining on private land and existing unpatented mining claims.

Scenario B-2 reduces the potential for a major mine in the area. Consequently, changes to moose habitat are unlikely, as are potential adverse effects associated with snowplowing and vehicle collisions, and increases in the human population.

Mule Deer, Elk (MIS-Custer NF)

Affected Environment

Elk are widely distributed within the Gallatin and Custer National Forests and exhibit seasonal movement in response to weather patterns. The higher elevations are used predominantly as summer range, while lower elevation areas are used for winter range. In the vicinity of the study area, elk movement to and from winter range does not occur along specific migration routes but takes place more as general patterns of movement to and from higher to lower elevation habitats. Winter range is characterized by low elevations, which in combination with southerly aspects, limits snow accumulation. Elk summering in the vicinity of the study area may belong to the Northern Yellowstone and Clarks Fork herd. Elk summer range is not a limiting factor.

A few elk are known to overwinter in winter range at the lower elevations along Soda Butte Creek in the vicinity of Cooke City (Map 3-18). This wintering area is located beyond the extreme eastern portion of the Northern Yellowstone Winter Range (NYWR). Although the number of elk wintering along Soda Butte Creek downstream of Cooke City varies from year to year depending on snow depths, the majority of elk in the northern portion of Yellowstone NP farther to the northwest in the Gardiner Basin area within the NYWR. This winter range supports one of the largest wintering populations of elk in North America. Snow conditions and topographic barriers physically precludes big game movement between the NYWR and the study area during the winter months.

According to Tom Lemke, MDFWP, (pers. comm., October 21, 1996) there is a relatively low population density of elk in the study area and summer/fall populations are estimated at 50 to 100 head. Hunting District #316 includes a relatively broad area encompassing the study area and is open for the early hunting season (Sept. 15) and continues into the general hunting season. Harvest data for elk is not available specific to the study area.

Mule deer occupy the study area in the summer and fall, migrating to the Gardiner Basin near Gardiner, Montana, for the winter. Habitats within the study area are used solely as summer and fall range because of heavy snowfall accumulations during the winter and spring months. Summer range for mule deer is not a limiting factor. According to Tom Lemke, MDFWP, (pers. comm., October 21, 1996), mule deer densities are relatively low within Hunting District #316 in which the general season was open for antlered deer only in 1996. The study area is only a portion of HD #316.

Summary of Effects

Future mining in the area could result in direct loss of habitat due to location of facilities, and increased access due to mining-related roads. Elk are typically less tolerant of disturbance than mule deer and are more likely to be displaced from the area with increasing levels of human disturbance. Construction of a major mine could result in the construction of a powerline corridor that would traverse portions of elk and mule deer winter range at the lower elevations. Human disturbance and habitat conversions associated with powerline construction would not have any measurable effect on elk or mule deer populations. Wyoming Highway 296 passes through elk and mule deer winter ranges. Construction of a major mine in the study area would result in snowplowing to keep U.S. 212 and WY 296 open during the winter months for ore concentrate transport to Cody, Wyoming. As a result, increased traffic could increase the risk of vehicle/deer collisions during the winter months along WY 296. The magnitude of this increase is unknown, but the risk would increase with duration of the period the highway is plowed and the volume of vehicle traffic on the highway during the time elk and deer are present.

With the increased human population associated with a mine, an increase in legal hunting of elk and deer would be likely. There is an increased risk that a major mine could create new access roads into areas that were previously unroaded and secure from hunting and trapping pressure. There is a the risk of illegal kills (poaching) of elk and mule deer resulting from the increased human population.

Scenario B-1 tends to maintain the existing security habitat in the study area, as most of the roadless areas are withdrawn from mineral entry. However, effects associated with increased population, snowplowing and increased highway traffic would still occur due to predicted mining on private and unpatented mining claims. Scenario B-2 results in minimal change to existing habitat, road densities, highway/big game collisions, and human population pressures.

Bighorn Sheep (Sub-Issue)

Affected Environment

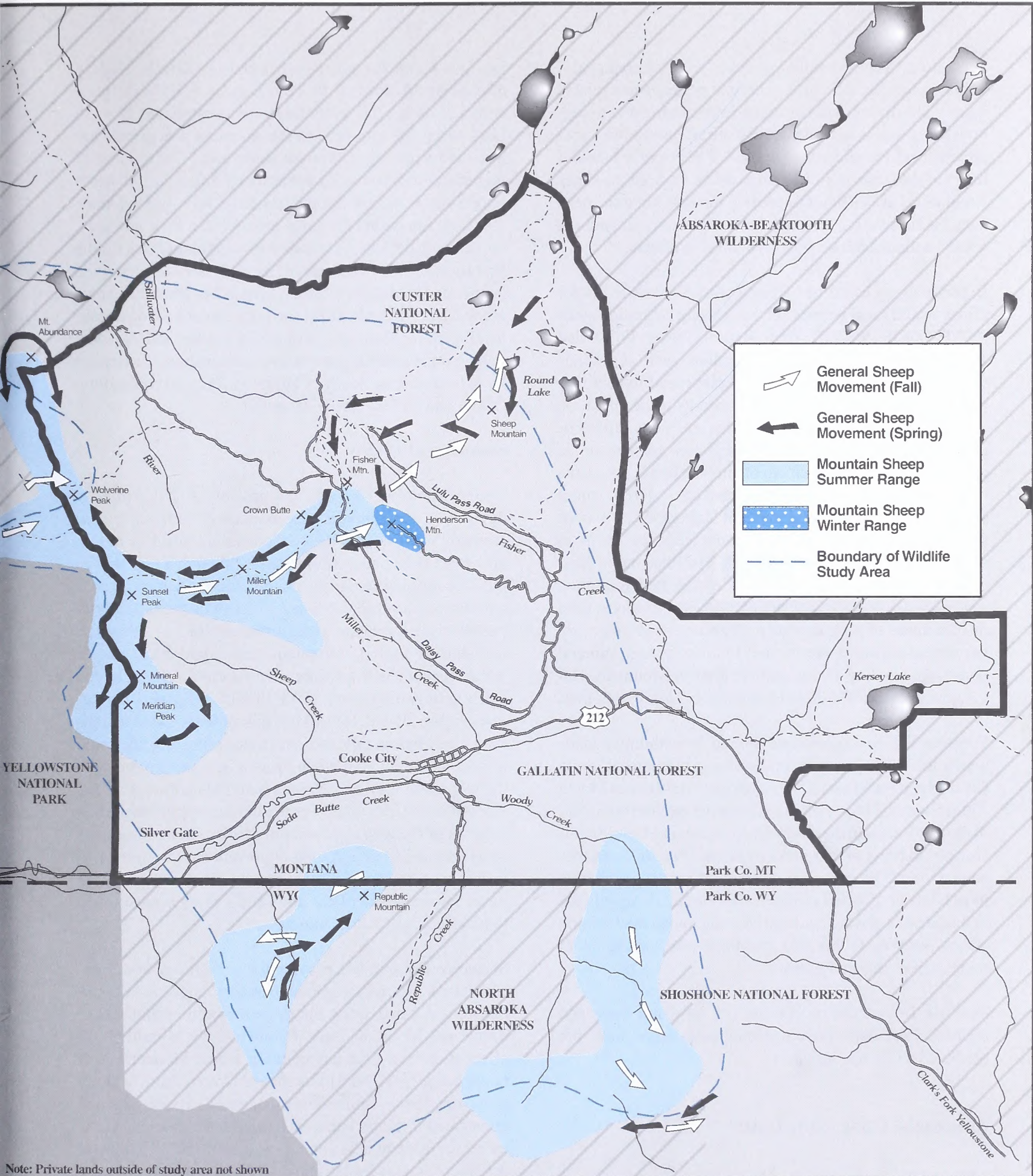
The study area includes portions of summer range for at least four different bighorn sheep herds: West Rosebud (about 60 head), Rock Creek (about 40 head), Clarks Fork (about 350 head), and Soda Butte Creek (about 20 - 30 head) herds. Animals from the West Rosebud and Rock Creek move through the study area to reach their summer range. Migration routes and summer ranges for the Clarks Fork herd and the remainder of the Rock Creek herd are located primarily to the south of Cooke City and Highway 212. Some animals from the Soda Butte herd that winter in Yellowstone NP move into Mount Abundance-Miller Mountain-Meridian Peak summer range. Travel routes and sheep range within the study area are displayed on Map 3-19.

Summer range for the West Rosebud herd extends generally from Henderson Peak west to Miller Mountain and Sunset Peak then south and north to Meridian Peak and Mount Abundance, respectively. These animals migrate to and from this range along the ridge from Sheep Mountain to Scotch Bonnet Mountain, then to Fisher Mountain and Henderson Mountain, and finally to Crown Butte and Miller Mountain where they disperse over their summer range. A few animals appear to remain for part of the summer on Sheep Mountain or Henderson Mountain. A portion of the Rock Creek herd (primarily rams) move west near the general study area following the same route as the West Rosebud sheep to summer range.

According to Tom Lemke, MDFWP, (pers. comm., October 21, 1996) the MDFWP conducted aerial surveys in conjunction with analysis for the New World Project. The maximum number of bighorn sheep observed during the summer from the air was approximately 20 to 30 head. MDFWP Hunting Regulations show the tentative license quota of three bighorn sheep in Hunting District # 501 (3 legal rams) and 502 (closed) in 1996.

Summary of Effects

The effect of human activities on bighorn sheep habitat and populations have been evaluated for a variety of situations. Negative effects are usually attributed to direct habitat loss or withdrawal from suitable habitat as a result of human disturbance influences. Numerous studies have attributed bighorn range abandonment to a variety of human activities. Bighorn avoidance of human activity is often interpreted as a negative effect upon the animals. However, associated adverse population effects are seldom demonstrated and the meaning of avoidance behavior may be



General Sheep Movement (Fall)

General Sheep Movement (Spring)

Mountain Sheep Summer Range

Mountain Sheep Winter Range

Boundary of Wildlife Study Area

Note: Private lands outside of study area not shown

Yellowstone National Park

Wilderness

Private lands (not subject to withdrawal)

National Forest Land

Study Area Boundary

Streams

Trails

Roads

National Forest Boundary

MAP 3-19

MOUNTAIN SHEEP RANGE AND MIGRATION ROUTES

ambiguous. A considerable volume of recent literature also indicates that the influence of human presence and related industrial activities are not necessarily detrimental to bighorn sheep unless key habitat areas are affected or sheep are pursued and intentionally harassed. The reviewed studies indicate that effects of human activity on bighorn sheep populations are difficult to predict, but that bighorn sheep have the ability to acclimate to human presence and mining related actions with no observed adverse effects.

Bighorn sheep could be affected where access roads for mines would cross or parallel the existing migration route (NWP PDEIS, Wildlife Tech. Report, Figure 17, 18 and 19). Additional mining related actions such as tailings facility, mill, and waste rock stockpile could impact bighorn sheep when located in close proximity to the migration corridor. Human activities adjacent to and along this corridor could disrupt bighorn sheep migration patterns in the area and result in displacement of animals into less suitable habitat areas or prevent their movement to and from winter and summer range. Displacement of bighorn sheep may be short-term since studies have demonstrated their ability to acclimate to mining-related actions. Facilities out of line-of-sight and over one mile from established migration routes and winter range are not likely to result in long-term displacement of bighorn sheep. Bighorn sheep range and movement corridors are located in areas of high mineral potential including Fisher and Henderson Mountain. Development of the NWP could affect habitat in these areas.

Scenario B-1 would preclude mining on withdrawn lands which include bighorn sheep habitat in the upper Woody Creek, Republic Mountain, and the ridgeline between Mount Abundance and Meridian Peak along the western boundary of the study area. In the absence of a withdrawal, these areas are open to filing of new mining claims. With this scenario, habitat in the Fisher Peak/Henderson Mountain area would most likely be affected as mineral development is predicted in this area on private land and existing unpatented mining claims. Activity in this area could also affect sheep travel routes across the study area.

Scenario B-2 would reduce the risk of disturbance and habitat related impacts from mining as no major mines are predicted under this scenario.

Mountain Goat (Sub-Issue)

Affected Environment

Mountain goats are a non-native species introduced in the 1950's into the Absaroka-Beartooth area. According to Shawn Stewart, MDFWP (pers. comm., October 17, 1996), the Beartooth mountains contain approximately 300 moun-

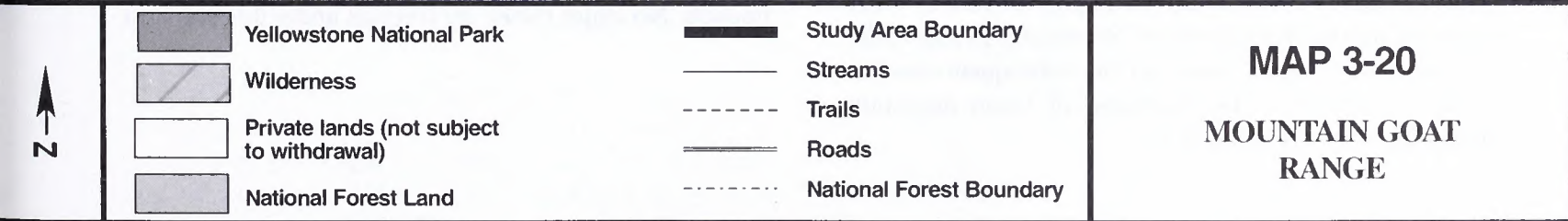
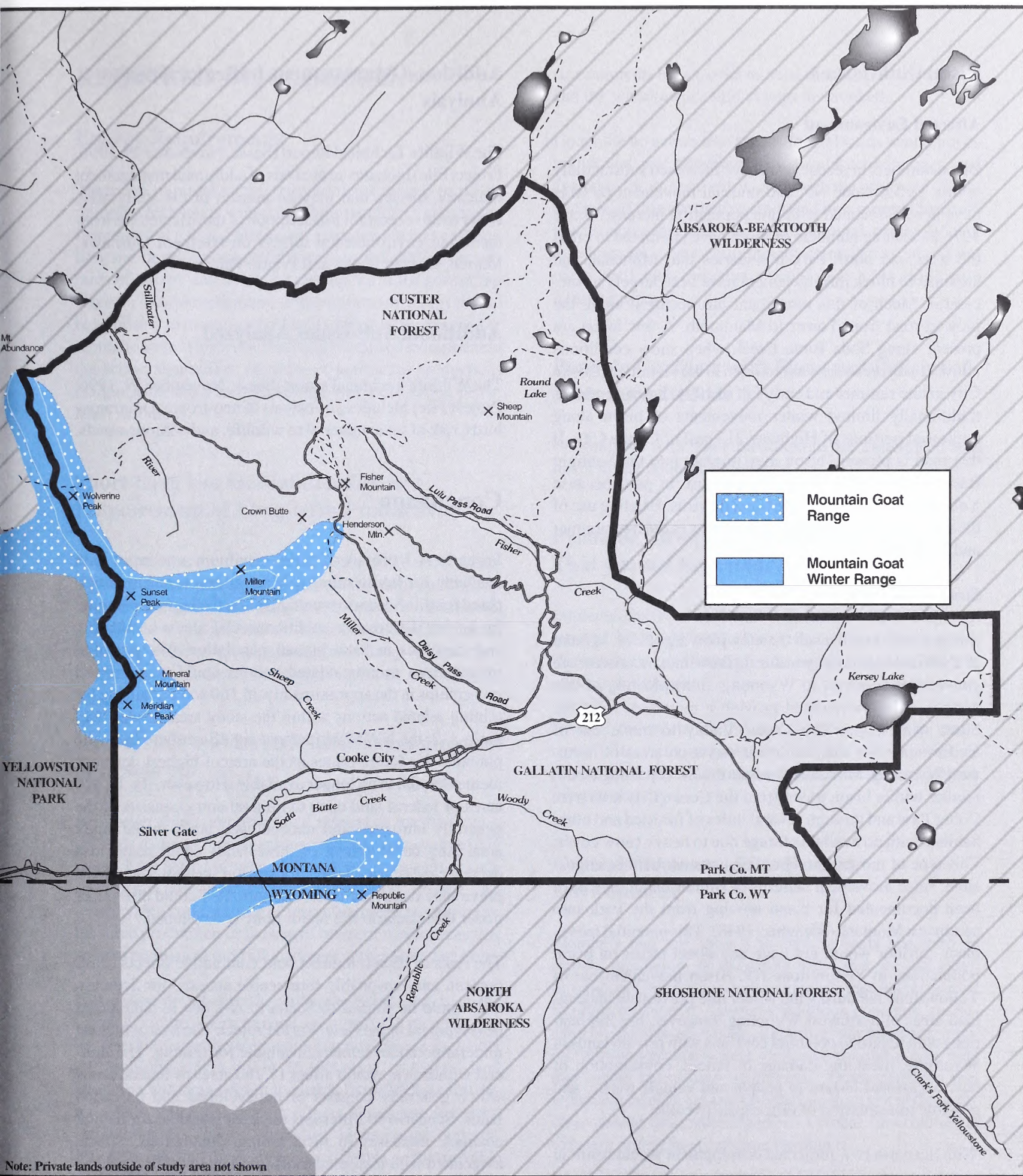
tain goats and the population trend is static to slightly decreasing. According to Tom Lemke, MDFWP, (pers. comm., October 21, 1996) there are an estimated 25 to 35 head during the summer and the mountain goat population trend is increasing within the study area. The number of mountain goats wintering in the area is unknown. All herds within the Beartooth mountains have been hunted since 1960s except within the study area. Within the study area, two hunting permits were issued for mountain goats for the first time in 1996. Portions of the study area are occupied year-round by mountain goats (Map 3-20). Mountain goats are located primarily along the high elevation ridges connecting Miller Mountain, Mount Abundance, and Meridian Peak. Single animals apparently reside on both the Republic Mountain area south of Highway 212 and Soda Butte Creek, and on Henderson Mountain.

Summary of Effects

Under Scenario A-1, B-1, and possibly A-2 if a mine is developed, human activities associated with mine construction and operation have the potential to displace mountain goats from occupied habitats. Although a few studies indicate some mountain goat habituation to human activity over time, most research has indicated that human activity can displace mountain goats from portions of otherwise undisturbed habitat. Mountain goat could be impacted where access roads for mines would cross or parallel the existing migration route (NWP PDEIS, Wildlife Tech Report, Figure 20 and 21). Additional mining-related actions such as tailings facility, mill, and waste rock stockpile could impact mountain goat when located in close proximity to the migration corridor. Human activities adjacent to and along this corridor could disrupt mountain goat migration patterns in the area and result in displacement of animals into less suitable habitat areas or prevent their movement to and from winter and summer range. The portion of the range between Miller Peak and Crown Butte is most likely to be affected by future mining activity.

Scenarios B-1 and B-2 provide for withdrawal from mineral entry key portions of mountain goat range near Republic Mountain and along the ridge between Mount Abundance and Meridian Peak. Future mining is unlikely to affect mountain goat use of these areas. Mountain goat range between Miller Mountain and Crown Butte is likely to be affected by future development on private land and unpatented mining claims in the area under Scenario B-1. Increases in the human population associated with mineral development may lead to increased risk of illegal harvest of mountain goats.

Under scenario B-2, no major mines are forecasted for the area. Existing mountain goat habitat would not likely be affected by future mining.



Bison (Sub-Issue)

Affected Environment

Bison numbers in recent years have increased substantially within Yellowstone NP, and unusual movement patterns have been associated with this population increase. Since 1976 increasing numbers of bison have attempted to cross the west and north Park boundaries into Montana, and attempts to block this movement have been largely unsuccessful. Much of this movement has occurred along the plowed road from Tower to Mammoth. A few bison are present along Soda Butte Creek when snow conditions allow. Bison presence was recorded in the vicinity of Cooke City in late summer and early fall of 1994. Snow depth has traditionally limited winter movements of bison along unplowed portions of Highway 212 east of Cooke City. If this road is plowed, bison may migrate into the Sunlight Basin of Wyoming. This is a concern, in part, because Yellowstone bison carry the brucella virus. Existing use of the study area is restricted to a few bison in the late summer and early fall.

Summary of Effects

A major mine could result the snowplowing of U.S. 212 and WY 296 to keep them open during the winter months for ore concentrate transport to Wyoming. Snowplowing of this portion of highway could provide a migration route for bison wintering in the Lamar Valley to move out of Yellowstone NP and into lower elevation areas of northwest Wyoming. Movement into northwest Wyoming would require winter bison travel from the Cooke City area over Colter Pass and through several miles of forested and other habitats with no available forage due to heavy snow cover. This type of movement would be unusual, but not impossible, since movement patterns of similar magnitude have been documented for bison moving from the Park into southwest Montana (Mcagher, 1988). This potential movement corridor would not have any direct effect on bison populations in Yellowstone NP. Bison movement out of Yellowstone NP during the winter into previously unoccupied areas of northwest Wyoming, however, has implications with regard to potential conflicts with private lands in Wyoming, including damage to fences, consumption of hay, occasional hazard to people and vehicle traffic, and possible transmission of brucellosis to cattle.

With Scenario B-1, projected development would result in snowplowing of US 212 thus increasing the risk of bison migration into the Sunlight Basin. Scenario B-2 reduces the likelihood of a major mine and the subsequent need to snowplow US 212. The likelihood of bison migration during the winter is reduced.

Additional Management Indicator Species Analysis

The Wildlife Technical Report (Sasse, November 29, 1996, Project File) includes an analysis of additional management indicator species that may be present in the study area. Refer to this report for a description of the affected environment and environmental effects on Northern Goshawk, Marten, Golden Eagle, and Prairie Falcon.

Additional Sub-issues Analyzed

The Wildlife Technical report (Sasse, November 29, 1996, Project File) includes an analysis of neo-tropical migratory birds, risk of toxic material to wildlife, and noxious weeds.

Conclusion

Scenario A-1 provides for the maximum amount of land available for future mining. Mineral development anticipated for this Scenario would result in the highest potential for habitat disturbance, additional road access and traffic, and increases in local human population. The potential impact from mining related actions could occur on all ownerships in the approximately 26,160 acres available for mining related actions within the study area. Under Scenario A-2, the NWM Agreement significantly reduces the potential for future mines as the area of highest development potential is no longer available. However, the 17,820 acres of federal land open to mineral entry consists of the generally unroaded and undeveloped lands in the study area. Any development of these lands could result in a decrease in security habitat for several species. The effects previously described under Scenario A-1 could also occur under this scenario if a major mine is developed.

The risks of direct, indirect, and cumulative effects (past, present, and reasonably foreseeable actions) for Scenario B-1 would be similar to Scenario A-1 due to anticipated development of the New World Project. The area of highest mineral potential remains available for mining. The mineral withdrawal would affect 17,760 acres of federal lands which generally consists of undeveloped and unroaded lands. Scenario B-2 presents the least potential for habitat changes, increases in local human populations, effects associated with increased traffic, and other mining-related impacts. No major mines are forecast under this scenario.

REQUIRED DISCLOSURES

Energy Requirements

There are minimal energy requirements related to determining which lands would be administratively withdrawn from mineral entry. Subsequent activities such as exploration and development could involve substantial expenditures of energy and would be considered at the permitting stage for mine development. Expenditures of energy would be expected to increase with higher levels of mining and or recreation use. However, the energy required to implement the action alternatives, in terms of petroleum products, is insignificant considering national and world-wide petroleum resources.

Short-term Use vs. Maintenance and Enhancement of Long-term Productivity

Short-term uses are those uses that generally occur annually. Long-term productivity refers to the ability of the land to produce a continuous supply of a resource. A mineral withdrawal would affect short-term uses related to mining. A mineral withdrawal helps maintain the long-term productivity of the land due to limitations on future mining.

Irreversible and Irretrievable Commitment of Resources

An irreversible commitment of resources results from a decision to use or modify resources that are renewable only over a long period of time. Nonrenewable resources such as minerals, are an irreversible commitment if used. An irretrievable commitment of resources refers to resources, resource production or the use of renewable resources that are lost because of land allocation or scheduling decisions.

A decision on whether to withdraw federal lands in the Cooke City area from mineral entry will not result in any irreversible or irretrievable commitment of resources. Under the proposed action, up to 26,160 acres of federal land would be withdrawn from locatable hardrock mineral entry. This action has certain effects which are described throughout this chapter, including an economic opportunity foregone, but these are not irreversible or irretrievable

commitments because the mineral resource remains on site and the withdrawal could always be revoked.

Under the no action alternative, federal lands would not be withdrawn and therefore they would remain open and available for mineral entry. Although the projected consequences of this alternative are based on a mineral forecast, this is not a decision to permit mineral exploration or development. Any commitment of resources would not occur until such time that a decision is to be made on a mining proposal.

Possible Conflicts with Plans and Policies of other Jurisdictions

No conflicts with other Jurisdictions are anticipated as a result of the mineral withdrawal.

Probable Adverse Environmental Effects That Cannot be Avoided

Implementation of a mineral withdrawal will not result in adverse environmental effects that cannot be avoided. Reclamation of disturbed sites would continue with a mineral withdrawal.

Lack of federal lands for mining-related facilities could result in less environmentally preferred development on private land, depending on the size and location of a future mineral activity.

Critical Elements of the Human Environment

Elements that are subject to requirements specified in statute, regulation, or executive order that are addressed throughout Chapter 3 include air quality, cultural resources, floodplains, Native American religious concerns, threatened or endangered species, hazardous wastes, water quality (drinking/ground water), wetlands/ riparian zones, wild and scenic rivers, and wilderness. Other elements that would not be affected because they do not exist in the study area include designated Areas of Critical Environmental Concern and prime or unique farmlands.

CHAPTER 4

CONSULTATION AND COORDINATION

EXTERNAL - GENERAL PUBLIC

Public Notices

The Department of the Interior published a "Notice of Proposed Withdrawal: Montana" in the *Federal Register* on September 1, 1995. In this Notice, the Secretary of the Interior proposed a 20-year withdrawal of federal locatable minerals on up to 19,100 acres near Cooke City, Montana. For a two-year period, no new mining claims could be filed on federal lands. Unpatented mining claims on federal lands remain subject to valid existing rights and could be developed. The withdrawal (as originally proposed) would not be applied to private lands acquired by the United States.

The lead agencies (Forest Service (FS) and Bureau of Land Management (BLM)) published an initial "Notice of Intent to Prepare a National Environmental Policy Act (NEPA) Analysis for a proposed mineral withdrawal in southwestern Montana" in the *Federal Register* on May 31, 1996. A news release was issued to area newspapers on June 7, 1996, describing the project; announcing dates for public scoping meetings in Red Lodge, Cooke City, and Livingston, Montana, and Cody, Wyoming; and asking the public to identify issues and concerns about the proposed Cooke City Area Mineral Withdrawal (CCAMW).

During the week of June 10, 1996, CCAMW team co-leaders from the FS and BLM telephoned known area claimholders, representatives of environmental organizations and of mining industry, offices of State government, and other persons who were known to have interests in the Cooke City area. These calls were intended to let these parties know that the agencies were initiating the proposed mineral withdrawal process for the Cooke City area, alert them to the time frames projected, solicit their participation, and encourage them to let others know about the process and how they, too, could become involved.

An "interested party" letter was sent to over 1,000 individuals and organizations on June 14, 1996. For the initial mailing, the CCAMW team used a mailing list compiled by the Gallatin National Forest for the New World Mine project and added names of others who had previously expressed interest in projects that occurred in the Beartooth Mountain Range. The "interested party" letter announced the scoping meeting dates and times and requested that those who wanted to be retained on the mailing list for the

proposed mineral withdrawal project return an enclosed mailer confirming their correct mailing address.

On June 19 the CCAMW team co-leaders provided a briefing on the proposed Cooke City Area Mineral Withdrawal process to members of the Montana Mining Association. On June 28 the team co-leaders provided a similar briefing for a group of members of environmental organizations (Montana Environmental Information Association, Beartooth Alliance, Sierra Club Legal Defense Fund, and Greater Yellowstone Coalition).

On July 8, a news release was issued to area news media to remind the public of the upcoming scoping meetings.

A scoping letter was sent to over 500 people who had requested to be placed on the mailing list for the CCAMW on July 10, 1996. This letter provided additional information about the project; confirmed the dates, times and locations of the upcoming scoping meetings; and asked the recipients to submit any issues or concerns they might have about the proposed mineral withdrawal or any information they might have about resources or uses within the withdrawal area.

Scoping Meetings

The public participation process got underway the week of July 15, 1996, with the four public meetings held in Red Lodge, Cooke City, Cody, and Livingston.

Handouts available to the public at the meeting included a copy of the scoping letter, a brief synopsis of the mining laws, a list of "Key Terms and Concepts" that were being used in the process, a copy of "Questions and Answers Regarding the Proposed Cook City Area Mineral Withdrawal," and a "Comment Form" that could be filled out at the meeting or be used to submit comments to the team at any time during the scoping process. A Proposed CCAMW location map was included with the scoping letter.

At the scoping meetings, the CCAMW team co-leaders from the FS and BLM provided background information, including description of the purpose for this proposed withdrawal and a synopsis of the analysis process. A brief overview of the preliminary issues that had been identified by the public and the interdisciplinary team was presented for consideration by attendees. These issues included:

- Proximity to Yellowstone National Park and the Absaroka- Beartooth Wilderness,
- Grizzly bear habitat,
- Impacts to private property,
- Water quality and quantity,
- Impact on possible millsites and potential loss of mineral sources,
- Maintenance of quality of life, and
- Economic impact of the withdrawal.

The team co-leaders also presented the alternatives tentatively being considered for analysis. One member of the interdisciplinary team also discussed the mining laws and described what a mineral withdrawal does. Following the presentations by the CCAMW interdisciplinary team members, the audience was asked to participate by identifying any issues or concerns they would like to have addressed in the analysis process or any alternatives that should be considered. The issues expressed by the audience were recorded on a “group memory” flipchart for reference by the CCAMW team.

Public attendance at the scoping meetings was as follows:

<i>Date</i>	<i>Meeting Location</i>	<i>Attendance</i>
July 15	Red Lodge, MT	45
July 16	Cooke City, MT	105
July 17	Cody, WY	35
July 18	Livingston, MT	55

The “formal” scoping period (90 days from publication of the Notice of Intent filed in the *Federal Register*) ended on August 29, 1996. Approximately 150 written responses were received from the public during the scoping period.

New World Mine Agreement, Modified Proposal, and Extended Public Scoping

On August 12, 1996, President Clinton announced that an agreement between Crown Butte Mines; the Greater Yellowstone Coalition, et al.; and the United States of America, had been reached. The Agreement provided for a halt to development of the New World Project and for federal acquisition of Crown Butte’s property interests, including private mineral estate and unpatented mining claims, in the vicinity of the proposed CCAMW. To meet the intent of this Agreement, the purpose and need for the

CCAMW were expanded. Approximately 40 additional responses were received during the extended scoping period. Issues raised during public scoping are discussed in Chapter 1.

On September 20, 1996, a notice of “Amendment to Proposed Withdrawal; Montana” was filed in the *Federal Register*, notifying the public that the BLM, with concurrence from the FS, had amended the petition and application for the proposed CCAMW to withdraw up to 22,000 acres of federal minerals from mineral entry for a period of 20 years. The modifications include withdrawal of any private lands and minerals that might be acquired in the study area in the future, either as a result of the NWM Agreement or from other willing sellers; acquired leasable hardrock minerals that otherwise would be open to leasing under the mineral leasing laws; and a 2,960-acre area encompassing Kersey Lake. Public comments on the project modifications were requested by December 19, 1996.

Based on public comments received in earlier scoping efforts, the BLM and FS decided to prepare an Environmental Impact Statement (EIS) to display the effects of the proposed mineral withdrawal. The “Notice of Intent to Prepare an Environmental Impact Statement” was published in the *Federal Register* on September 27, 1996.

On September 30, 1996, the lead agencies sent a letter to approximately 700 people on the mailing list. This letter:

- provided an update on the process,
- described why and how the CCAMW proposal had changed as a result of the New World Mine Agreement,
- confirmed that an EIS would be prepared,
- gave a list of the issues that would be addressed in the EIS,
- described the two alternatives that would be analyzed in detail (“No Action” and “Proposed Action”),
- displayed the alternatives that had been considered but dismissed from detailed analysis, and
- announced future public involvement opportunities.

On October 1, 1996, the CCAMW team co-leaders made a presentation to the Cooke City Chamber of Commerce, providing a description of the modifications in the Purpose and Need for the Withdrawal and in the Proposed Action. They also discussed the issues and concerns that had resulted from the first scoping period and the alternatives

that were currently being considered in the analysis process.

The lead agencies held two additional scoping meetings to determine whether or not there were any further issues that had arisen, based on the project modifications. The meetings were held in:

- Cody, Wyoming, on October 23, 1996 (12 attended)
- Livingston, Montana, on October 24, 1996 (24 attended)

The meetings followed an open house format where CCAMW team co-leaders and other team members were available to answer any questions about the withdrawal analysis. The open house format was used to provide the public with one-on-one contact with the team members in order that they might be able to more fully explore questions and concerns. Maps were displayed to provide a better visualization of how each of the areas would be addressed (withdrawn/not withdrawn) in each alternative.

To ensure that no "immediately affected" individuals had been missed in the scoping process, on October 28, 1996, the lead agencies issued a letter to 383 people who were identified as owning property within the study area. This letter provided background on the project, issues, and alternatives; an update on the analysis; and an invitation to be involved in the process.

EXTERNAL - ELECTED OFFICIALS, AMERICAN INDIAN TRIBES

Congressional Delegations

The CCAMW team began contacting the Congressional delegations to provide briefings via telephone with delegation staffs for Senators Craig Thomas and Alan Simpson and Congresswoman Barbara Cubin of Wyoming during the week of June 10-14. The team also visited with Senator Max Baucus' and Senator Conrad Burns' Billings staffs on June 18 and June 20, respectively, to provide briefings on the withdrawal proposal and the process. The preliminary public mailing announcing the project and a briefing paper describing the project were FAXed to Congressman Pat Williams' Billings office on June 18 and a member of his staff attended the briefing with Senator Baucus' staff. On July 17, the team met with Wyoming Senator Simpson's staff to provide a briefing. The other two Wyoming congressional offices were invited to the briefing, but were

unable to attend. On September 26 and 27, respectively, the CCAMW team again visited with Senators Burns' and Baucus' staff members to update them on the project and to discuss the amendment to the proposed withdrawal as a result of the NWM Agreement. Senator Burns' staff requested and was provided with budget information for the CCAMW process on October 10, 1996. The Wyoming congressional delegation members were provided with a briefing and a report on the progress of the analysis in Cheyenne, WY, on November 26, 1996 by CCAMW team co-leaders.

State, County, and Local Government

On June 12, the CCAMW team contacted the Montana Department of DEQ to provide information regarding initiation of the CCAMW study by the FS and BLM. The Governors' Offices in Helena, MT and Cheyenne, WY were included in the initial public mailing of CCAMW information (June 14, 1996); they have been included in all subsequent public mailings.

The Montana State Historic Preservation Office (SHPO) was contacted by the FS on September 17, 1996, to solicit comments on the mineral withdrawal project. The SHPO acknowledged this contact on September 24, 1996.

On October 8, 1996, the CCAMW team went to Helena to brief officials from the Montana Department of Environmental Quality on the withdrawal proposal and changes to the proposal as a result of the NWM Agreement.

The Wyoming Governor's Office hosted the briefing for Wyoming State officials and the congressional delegation in Cheyenne, WY, on November 26, 1996.

The CCAMW team contacted the County Planner for Park County, MT, on June 13, 1996, to provide information about the CCAMW project. County Commissioners of Carbon, Park, Gallatin, Stillwater, Sweetgrass, and Yellowstone County, MT, and Park County, WY, were included in the initial public mailings of information about the CCAMW project (June 14, 1996).

Montana and Wyoming State Offices and County Commissioners were invited to attend an interagency scoping meeting held in Billings on July 25, 1996. Those included in the invitation to the States and Counties were as follows:

- Montana Governor's and Lieutenant Governor's Offices
- Montana Department of Environmental Quality

- Montana Department of Fish, Wildlife, and Parks
- Montana Department of Natural Resources and Conservation
- Montana Department of Commerce
- Montana State Historic Preservation Officer
- Wyoming Governor's Office
- Wyoming Game and Fish
- State of Wyoming Environmental Quality
- Wyoming State Planning Coordinator's Office
- Carbon County (MT) Commissioners
- Park County (MT) Commissioners
- Stillwater County (MT) Commissioners
- Sweetgrass County (MT) Commissioners
- Gallatin County (MT) Commissioners
- Yellowstone County (MT) Commissioners
- Park County (WY) Commissioners

Included with the letter of invitation was an updated briefing on the process and a request for agencies to identify concerns that they may have for consideration in the CCAMW process.

American Indian Tribes

Two American Indian Tribes were initially identified as potentially having interests in the CCAMW area, the Crow Tribe and the Shoshone Bannock Tribe. These tribes were included in the initial public mailing of information about the CCAMW project (June 14, 1996), sent an invitation to the interagency scoping meeting held in Billings on July 25, 1996.

Subsequently, contacts were made by letter and by telephone with five American Indian Tribes who are known or thought to have occupied or used the study area in the historic past. These are the Shoshone Bannock Tribe at Ft. Hall, ID; the Shoshone at Ft. Washaki, WY; the Crow; the Arapho; and the Northern Cheyenne.

No traditional cultural sites were reported in the study area, either in telephone conversations or by letter. None are

listed in the records of the State Historic Preservation Office.

INTERNAL - CO-LEAD AND OTHER FEDERAL AGENCIES

The lead agencies for the EIS are the U.S. Department of Agriculture, Forest Service (FS) and the U.S. Department of the Interior, Bureau of Land Management (BLM). The agencies used an interagency interdisciplinary team (including members from the Northern Regional Office of the FS; the Custer, Gallatin, Flathead, Kootenai and Clearwater National Forests; and the BLM Montana State Office to prepare the analysis documented in this EIS.

The CCAMW team began "scoping" of other Federal agencies in June, 1996. Preliminary information about the project was given to the Office of Environmental Policy and Compliance, the Environmental Protection Agency (Denver), the United States Geological Survey, and the National Park Service. In telephone contacts during June and July, agency representatives were asked if there were any concerns they wanted to have addressed in the analysis. On July 17, 1996, a letter was sent to 35 Federal, state, and local agencies and tribal governments inviting them to attend an "agency scoping meeting" which was held on July 25, 1996, in Billings. Federal agencies included in this invitation were as follows:

- U.S. Fish and Wildlife Service (Helena, MT)
- National Park Service (Geological Resources Div., Lakewood, CO)
- National Park Service (Yellowstone National Park)
- U.S. Geological Survey (Denver, CO)
- U.S. Bureau of Reclamation (Billings, MT)
- Army Corps of Engineers (Planning Div., Omaha, NE)
- Environmental Protection Agency (Helena, MT)
- Office of Environmental Policy (Denver, CO)

The letter to these agencies also invited "any agency concerns, issues or relevant data" that agencies would like to provide for the scoping process. U.S. Fish and Wildlife and the National Park Service were able to have representatives attend the meeting.

Although not formal cooperating agencies (i.e., having signed a Memorandum of Understanding regarding the preparation of this EIS), the U.S. Geological Survey has provided data used in the analysis process and the U.S. Fish and Wildlife Service (USF&WS) has provided a list of federally listed species that may occur within the proposed CCAMW project. USF&WS has also provided information regarding the management of wolf populations in this area and will issue a Biological Opinion addressing Federally listed species as they are affected in the lead agencies' preferred alternative.

The U.S. Fish and Wildlife Service, U.S. Geological Survey, National Park Service, Environmental Protection Agency, United States Department of Justice, and Council on Environmental Quality, were included in a federal interagency review of a preliminary Draft EIS (DEIS) before this document was finalized for public release. Comments from these agencies were considered, and suggestions for improving the document were utilized, where appropriate, in the DEIS.

CHRONOLOGY OF PUBLIC PARTICIPATION ACTIVITIES (AGENCIES AND GENERAL PUBLIC)

1995

Sept 1 *Federal Register* Notice of Proposed Withdrawal : Montana

1996

May 31 *Federal Register* Notice to prepare an Environmental Analysis and public meetings.

June 7 News Release announcing start of project.

June 10 Week of June 10, telephoned initial key contacts, claim holders, environmental organizations, mining industry representatives, MT and WY State government contacts.

June 14 Letter to more than 1,000 people announcing project.

June 18 Interviewed by Bureau of National Affairs, for Daily Env. Report.

Briefed Senator Max Baucus' staff (Sharon Peterson) and Congressman Pat Williams' staff (George Parisot)

June 19 Met with Montana Mining Association.

June 20 Briefed Senator Burns' Staff (Kathy Sparr).

June 28 Briefed representatives from Greater Yellowstone Coalition, Northern Plains Resource Council, Sierra Legal Defense Fund, Montana Environmental Information Center.

July 8 Issued News Release announcing meetings to media.

July 10 Scoping letter sent to complete mailing list, including Montana and Wyoming State government officials.

July 15 Red Lodge meeting (45 attended).

July 16 Cooke City meeting (105 attended).

July 17 Cody meeting (35 attended).

Briefed Wyoming Senator Simpson's Staff (Karen McCreery).

Letter to other NF and BLM Offices, Federal and State agencies, Indian Tribes, County Commissioners announcing interagency/intergovernmental scoping meeting to be held July 25, 1996.

July 18 Livingston Meeting (55 attended).

July 25 Agency scoping meeting attended by representatives from National Park Service; U.S. Fish and Wildlife Service; Montana Fish, Wildlife and Parks; Montana Department of Fish, Wildlife and Parks; Gallatin National Forest; Montana State Office, BLM; Custer National Forest; and Park County, Montana.

- Aug 5 Letter to tribes requesting comments and concerns by September 6.
- Aug 8 Provided initial telephone briefing about project to Crow Tribe Official and solicited response regarding concerns about the effect of the project on any traditional Crow cultural properties in the study area(John Pretty On Top, Crow Cultural Committee).
- Aug 8 Provided initial telephone briefing about project to Shoshone Bannock Tribe Official (Randy Thompson, Cultural Committee).
- Aug 19 Telephone discussion with Shoshone Bannock Tribe Official (Diana Yupe) to answer questions about the project, and to solicit response regarding concerns about the effects of the proposed project on any traditional Shoshone Bannock cultural properties in the study area.
- Aug 19 Contacted Shoshone Tribe (Ivan Posey) to provide initial briefing about the proposed withdrawal and to solicit response regarding concerns about effect of the project on traditional Shoshone cultural properties in the study area.
- Aug 19 Contacted Arapaho Tribe (Francis B. Brown, Arapaho Cultural Committee) to provide a briefing about the proposed withdrawal project and to solicit response regarding concerns about the effect of the projects on traditional Arapaho Tribe cultural properties in the study area.
- Sept 20 Notice of Amendment to Proposed Withdrawal.
- Sept 26 Briefed Senator Burns' Office (Dwight McKay).
- Sept 27 Briefed Senator Baucus' Office (Marilyn Kramer).
- Sept 27 Phoned Jim Magagna, Wyoming Director of Federal Land Policy; Offered to brief Wyoming State Government officials.
- Sept 27 *Federal Register* Notice of meetings and Notice Of Intent to prepare an EIS.
- Sept 30 Letter to 700 people giving update on status and announcing meetings.
- Oct 1 Briefed Cooke City Chamber of Commerce
- Oct 8 Briefed officials from Montana Department of Environmental Quality. Provided a phone briefing of Senator Simpson's staff and Congresswoman Cubin's staff.
- Oct 10 Responded to request for budget information from Senator Burns' staff (Dwight McKay).
- Oct 11 News Release announcing meetings and current status.
- Oct 13 Open House in Cody (12 attended).
- Oct 13 Letter to 383 property owners within the withdrawal study area providing background and update.
- Oct 24 Open House in Livingston (24 attended).
- Nov 18-26 Letters to Yellowstone National Park, USGS, USF&WS, EPA, and CEQ inviting their participation in the review of the PDEIS.
- Nov 26 Briefed Wyoming Congressional delegation, key staff members, Jim Magagna (WY Commissioner of Public Lands), and others from WY state government.
- Dec 10 Washington, D.C., briefing for Environmental Protection Agency, Bureau of Land Management, Department of Justice, Department of Agriculture, Department of the Interior, and Forest Service
- 1997**
- Jan 1 Federal Interagency review of Preliminary Draft EIS by Yellowstone National Park, EPA, CEQ, DOJ, USFS, BLM, USF&WS, NPS, USGS

DISTRIBUTION AND REVIEW OF THIS DRAFT EIS

Distribution

Copies of this Draft EIS (or the DEIS Summary) are being mailed to over 900 persons, groups, local governments, and agencies that have expressed an interest in the project. The mailing list was compiled using the names and addresses from the following sources:

- Parties who requested to have their names placed on the mailing list for the project;
- Parties who have participated at meetings and/or who have submitted written comments to date in the process;
- Federal and State agencies consulted during the preparation of the EIS; and
- other Federal, State, and local (to the study area) entities potentially affected by the proposed withdrawal.

Review

Copies of this EIS can be reviewed at the following locations:

- Northern Region Office, U.S. Forest Service, Missoula, Montana
- Bureau of Land Management, Montana State Office, Billings, Montana
- Bureau of Land Management, Wyoming State Office, Cheyenne, Wyoming
- Bureau of Land Management, Worland District Office, Worland, Wyoming

- Bureau of Land Management, Cody Resource Area Office, Cody, Wyoming
- Custer National Forest, Supervisor's Office, Billings, Montana
- Gallatin National Forest, Supervisor's Office, Bozeman, Montana
- Helena National Forest, Supervisor's Office, Helena, Montana
- Beartooth Ranger District Office, Red Lodge, Montana
- Big Timber Ranger District Office, Big Timber, Montana
- Gardiner Ranger District Office, Gardiner, Montana
- Livingston Ranger District Office, Livingston, Montana
- Shoshone National Forest, Supervisor's Office, Cody, Wyoming
- Clark Fork Ranger District Office, Powell, Wyoming
- Environmental Protection Agency, Denver, Colorado
- Yellowstone National Park, Mammoth, Wyoming

Copies are also being placed in local public libraries in Billings, Bozeman, Livingston, Red Lodge, MT, and Cody and Powell, WY for public perusal.

Copies of the document also are available from the following address:

Cooke City Area Mineral Withdrawal Team
222 North 32nd Street
P.O. Box 36800
Billings, Montana 59107-6800

TABLE 4-1. LIST OF PREPARERS

List of Preparers			
Name	Responsibility	Credentials	Years Experience
John Thompson	Team Co-Leader	BS-Economics, Political Science MS-Agricultural/Economics	19
Larry Timchak	Team Co-Leader	BS-Forest Management	20
Paul Beckley	Economic	BS-Economics, CPA MF-Master of Forestry PhD(ABD)-Resource Economics	20
Rebecca Casillas	Mapping		17
Diana Enright	Public Involvement	BA - Journalism	7
Hank Finch	Recreation	BS-Forest Resources	20
Rita L. Frasure	Staff Assistant	BS-Geology	-
Dee Dee Green	Cultural	PhD-Anthropology	42
Jim Gruber	Geology/ Minerals Forecast	BA-Geology	21
Kathie Jewell	GIS Coordination	BS-Wildlife Science	15
Sherry L. Milburn	Public Participation Technical Coordination	BS-Education (Biology) MS-Counseling	20
Boje Nielsen	Recreation/Visual	BS-Natural Resources MLA-Master of Landscape Architecture	19
Barbara A. F. Ott	Human Dimension Writer/Editor	BA-Business Administration MS-Management (Special Study of Rural Development and Planning)	15
Donald C. Sasse ¹	Wildlife	MS-Wildlife Management/Biology	18
Steve Shelly ¹	Wildlife	BS/MS-Botany	15
Henry F. Shovic	Soils	PhD-Soils	20
Scot Shuler ¹	Fisheries	BS-Fish & Wildlife Biology MS-Aquatic Ecology	6
Jay Spielman	Geology	BS-Geology	20
Mark Story	Hydrology	MS-Watershed Management	22
List of Preliminary Draft EIS Reviewers			
Name	Responsibility	Agency	
Carol McCoy Brown	Geology	USFS-Custer NF, Supervisor's Office	
Jim Gray	NEPA/Technical Coordination	USFS- Custer NF, Supervisor's Office	
Steve Christiansen	NEPA/Technical Coordination	USFS- Gallatin NF, Supervisor's Office	
Greg Kujawa	NEPA/Coordination with New World Mine EIS	USFS-Gallatin NF, Gardiner Ranger District	

Richard Marshall	Geology/Economics	USFS, Northern Region, Missoula, MT
Mary Lennon	Geology	USFS-Gallatin NF, Livingston RD, Livingston, MT
Kimberly Schlenker	Recreation	USFS-Gallatin NF, Supervisor's Office, Bozeman, MT
Dan Tyers	Biological Assessment	USFS-Gardiner RD, Gallatin NF, Gardiner, MT
Pat Pierson		USFS-Custer NF, Beartooth RD, Red Lodge, MT
Alan Campbell	Office of the General Council	Missoula, MT
Joan Trent	Sociology	BLM-Montana State Office, Billings, MT
Greg Albright	Public Involvement	BLM-Montana State Office, Billings, MT
Dee Baxter	Lands	BLM-Montana State Office, Billings, MT
Glen Kerestes	Minerals	BLM-Montana State Office, Billings, MT
Scott Haight	General	BLM-Lewistown District Office, Lewistown, MT
Karen Dunnigan		Field Solicitor's Office, Billings, MT
Don Ogaard		BLM-Worland District Office, Worland, WY
Lynn Rust		BLM-Wyoming State Office, Cheyenne, WY
Kemper M. McMaster	Field Supervisor	USFWS, Helena, MT
Joe Fontane		USFWS, Helena, MT
Shawn Stewart	Wildlife	MDFWP, Red Lodge, MT
Tom Lemke	Wildlife	MDFWP, Livingston, MT
Anne Vandehey	Contact-CCAMW EIS	USFWS, MT & WY, Helena, MT
Charles P. Davis	Field Supervisor	USFWS, Cheyenne, WY
Beverly Sherman Nash	NEPA	Department of Justice, Washington, DC
Mary Jennings		USFWS, Contact for Consultation, Cheyenne, WY
Larry Roop	Field Supervisor	WYGF, Cody, WY
Jane Hammarstrom	Geology	USGS, Reston Virginia
Brad Van Gosen	Geology, Water	USGS, Reston, VA
William Miller	Water Chemistry	USGS, Denver, CO
Wes Wilson	Team Lead	Environmental Protection Agency (EPA), Region 8, Denver, CO
Rob Walline	Mining Policy	EPA, Region 8, Denver, CO
Orville Kiehn	Mining Technology	EPA, Region 8, Denver, CO
Mike Wireman	Hydrogeology	EPA, Region 8, Denver, CO
Peggy Livingston	Legal	EPA, Region 8, Denver, CO
Steve Potts	NEPA Compliance	EPA, Montana
Elaine Suriano	NEPA Compliance	EPA, Washington, DC
Barbara Schmalz		Office of Environmental Policy, Denver, CO
Michael Finley		National Park Service, Yellowstone National Park
Richard Trenholme	ERO Resources	Denver, CO

APPENDIX A

FEDERAL REGISTER NOTICE OF PROPOSED MINERAL WITHDRAWAL AND FEDERAL REGISTER NOTICE OF AMENDMENTS TO THE PROPOSED MINERAL WITHDRAWAL

[Federal Register: September 20, 1996 (Volume 61, Number 184)]
[Notices]
[Page 49480-49481]
From the Federal Register Online via GPO Access [wais.access.gpo.gov]

DEPARTMENT OF THE INTERIOR
[MT-960-1990-00-CCAM; MTM 84500]

Amendments to Proposed Withdrawal; Montana

AGENCY: Department of the Interior.

ACTION: Notice.

SUMMARY: The Department of the Interior, Bureau of Land Management, with concurrence from the Department of Agriculture, Forest Service, has amended the withdrawal petition and application for the proposed Cooke City Area Mineral Withdrawal to include additional Federal lands, non-Federal minerals within the withdrawal boundary which may be acquired by the United States, and segregation from mineral leasing, except oil and gas. This amendment will segregate the lands described below from location and entry under the mining laws and the mineral leasing laws, except oil and gas. This amendment will also segregate those lands in the original application from the mineral leasing laws, except oil and gas.

FOR FURTHER INFORMATION CONTACT:

Comments should be sent to the Cooke City Area Mineral Withdrawal Team, P.O. Box 36800, Billings, Montana 59107, by December 19, 1996.

SUPPLEMENTARY INFORMATION: On August 27, 1996, and September 13, 1996, petition amendments were approved, and on September 16, 1996, an application amendment was approved.

[[Page 49481]]

These amend the original petition and application to include the following Federal lands and non-Federal minerals within the withdrawal boundary which may be acquired by the United States, and to withdraw the following lands and those in the original petition from mineral leasing, except oil and gas. The segregative period for all lands in this proposed withdrawal remains the same.

Principal Meridian, Montana

Federal Lands--

T. 15 E.,

Sec. 32, that part of SW\1/4\SW\1/4\ lying outside of the Absaroka-Beartooth Wilderness Boundary.

T. 9 S., R. 15 E.,

Sec. 21;

Sec. 22;

Sec. 23, lots 2 and 3, N\1/2\, E\1/2\SE\1/4\, and bed of Kersey Lake riparian to lots 2 and 3;

Sec. 26, bed of Kersey lake riparian to NW\1/4\NW\1/4\;

Sec. 27, lots 1 and 2, S\1/2\NE\1/4\, NW\1/4\, and bed of Kersey Lake riparian to lots 1 and 2;

Sec. 28, lots 1 to 4, inclusive, and 6 to 9, inclusive, S\1/2\NW\1/4\, S\1/2\SW\1/4\, and SE\1/4\SE\1/4\, and that part of lot 5 and SE\1/4\SE\1/4\ lying outside of the Absaroka-Beartooth Wilderness boundary;

Sec. 33, lots 1 to 4, inclusive, W\1/2\NE\1/4\, SE\1/4\NE\1/4\, and NW\1/4\, and that part of the NE\1/4\NE\1/4\ lying outside of the Absaroka-Beartooth Wilderness Boundary;

Sec. 34, lot 4, and that part of lot 3 and W\1/2\NW\1/4\ lying outside of the Absaroka-Beartooth Wilderness Boundary.

The areas described aggregate approximately 2,965.00 acres.

Non-Federal Minerals--Approximately 4,158.00 acres--

All non-Federal minerals, if returned to Federal ownership, would without further action become subject to the terms and conditions of the subject withdrawal.

The purpose of the proposed withdrawal is for protection of the watersheds within the drainages of the Clarks Fork of the Yellowstone River, Soda Butte Creek, and the Stillwater River, and the water quality and fresh water fishery resources within Yellowstone National Park. The amendments are to include lands identified during public scoping meetings and to meet the intent of the New World Mine Agreement signed August 12, 1996, by Crown Butte Mines, Inc., the Greater Yellowstone Coalition, and the United States.

A withdrawal application, as amended, will be processed in accordance with the regulations set forth in 43 CFR part 2300.

Existing uses of the segregated lands may be continued except for the location or relocation of mining claims during the pendency of the segregative period, including but not limited to all legal ingress and egress to valid mining claims and patented claims, all rights-of-way, all access to non-Federal lands, all current recreational uses, and all commercial uses requiring special use permits.

Thomas P. Lonnie,

Deputy State Director, Division of Resources.

[FR Doc. 96-24144 Filed 9-19-96; 8:45 am]

BILLING CODE 4310-DN-M

DEPARTMENT OF THE INTERIOR
[MT-930-1220-00; MTM 84500]

Notice of Proposed Withdrawal; Montana

AGENCY: Department of the Interior.

ACTION: Notice.

SUMMARY: The Department of the Interior proposes to withdraw approximately 19,100 acres of Federal lands for protection of the watersheds within the drainages of the Clark's Fork of the Yellowstone, Soda Butte Creek, and the Stillwater River, and the water quality and fresh water fishery resources within Yellowstone National Park. This notice segregates the land for up to 2 years from location and entry under the mining laws. The lands will remain open to mineral leasing.

FOR FURTHER INFORMATION CONTACT: Jeff Holdren, 1620 L Street NW, Washington, D.C. 20240, 202-542-7779.

SUPPLEMENTARY INFORMATION: On August 29, 1995, a petition was approved allowing the Assistant Secretary, Policy, Management, and Budget to file an application to withdraw the following described Federal lands from location and entry under the mining laws, subject to valid existing rights:

Principal Meridian, Montana

- T. 8 S., R. 14 E.,
 - Sec. 25, unsurveyed;
 - Sec. 33, partly unsurveyed;
 - Secs. 34 to 36, inclusive, unsurveyed.
- T. 9 S., R. 14 E.,
 - Secs. 1 to 28, inclusive;
 - Secs. 33 to 36, inclusive, partly surveyed.
- T. 8 S., R. 15 E.,
 - Secs. 30 and 31.
- T. 9 S., R. 15 E.,
 - Secs. 5 to 8, inclusive;
 - Secs. 17 to 20, inclusive;
 - Secs. 29 to 32, inclusive.

The areas described aggregate approximately 19,100 acres in Park County, Montana.

The purpose of the proposed withdrawal is for protection of the watersheds within the drainages of the Clark's Fork of the Yellowstone, Soda Butte Creek, and the Stillwater River, and the water quality and fresh water fishery resources within Yellowstone National Park.

A withdrawal application, when filed, will be processed in accordance with the regulations set forth in 43 CFR 2300.

For a period of 2 years from the date of publication of this notice in the Federal Register, the lands will be segregated from location and entry under the mining law, subject to valid existing rights, unless

the application is denied or canceled or the withdrawal is approved prior to the end of the segregation period.

Existing uses of the segregated lands may be continued except for the location or relocation of mining claims during the pendency of the 2-year segregative period, including but not limited to all legal ingress and egress to valid mining claims and patented claims, all rights-of-way, all access to non-Federal lands, all current recreational uses, and all commercial uses requiring special use permits.

Dated: August 29, 1995.
Thomas P. Lonnie,
Deputy State Director, Division of Resources.
[FR Doc. 95-21888 Filed 8-31-95; 8:45 am]
BILLING CODE 4310-DN-P

APPENDIX B

LOCATABLE MINERAL RESOURCES

FORECAST FOR FUTURE MINERAL ACTIVITY

INTRODUCTION

Purpose

The purpose of this Forecast for Future Mineral Activity is to provide a hypothetical model for future locatable (hardrock) mineral activity within the boundaries of the proposed 22,000 acre Cooke City Area Mineral Withdrawal. The forecast addresses the potential for future mining and will be used to analyze possible impacts to other resources which in turn will help determine the need for a mineral withdrawal.

Scope

This forecast represents the current management situation identified in the Gallatin and Custer Forest Plans which provides for claim staking, exploration, and mining under the General Mining Law of 1872 and other applicable laws and regulations. It does not reflect the recent changes in management conditions relating to the NWM Agreement of August 12, 1996. The forecast presents the type and level of locatable mineral activity that may take place in the absence of a withdrawal and in the event that the Agreement does not materialize. In other words, the forecast depicts the maximum level of mineral activity to be analyzed in the withdrawal EIS.

The forecast is based on identified mineral reserve and undiscovered mineral resource capabilities of the lands involved, and applies conditions and assumptions with, for the most part, geologic data that are insufficient for defining ore bodies. Economic and regulatory conditions, and land ownership considerations are also factored into this analysis. With the exception of Crown Butte's mine proposal, this forecast does not constitute proof that mineable mineral deposits are present or absent. The type and level of activity identified in this forecast is subject to changes in available geologic data and technology as well as changes in economic, administrative, and legislative conditions.

Within the boundaries of the proposed withdrawal of 22,000 acres of federal land is approximately 4,160 acres of private land. About 3,315 acres of this private land was patented as

mining claims and represents the majority of historic mining activity noted in Reed (1950) as well as Crown Butte's recent exploration activities and their suspended mining proposal. The area in the center of the proposed withdrawal containing the highest density of patented lands (mixed with unpatented claims) coincides with the area having the highest mineral development potential (Map 3- 11). Current unpatented mining claims, most of which are in the same vicinity of high density patented lands, consist of 272 lode claims (~3,986 acres), 202 mill sites (~1,010 acres), and 3 placer claims (~65 acres).

LOCATABLE MINERALS ADMINISTRATION

General Mining Law of 1872

Under the mining law a U.S. citizen has a statutory right to go on unappropriated and unreserved federal lands for the purpose of mineral prospecting, exploration, development, and extraction of locatable minerals. The basic elements of the law consist of discovery of a valuable mineral deposit, location, recordation, and maintenance of mining claims, and patenting.

All National Forest System lands which were formerly public domain lands that have not been appropriated, withdrawn, or segregated from location and entry and have been or may be shown to be mineral lands are open to prospecting for locatable, or hardrock, minerals (16 U.S.C. 482). In prospecting, locating, and developing the mineral resources, all persons must comply with the rules and regulations covering the National Forests (16 U.S.C. 478).

Mining and Mineral Policy Act of 1970

It is the policy of the Federal Government, in the national interest, to foster and encourage private enterprise in "the orderly and economic development of domestic mineral resources, reserves, and reclamation of metals and minerals."

Organic Administration Act

In as much as the General Mining Law and the Mining and Mineral Policy Act establish mineral development rights and objectives, all activities associated with mining must be conducted in accordance with all Federal, State, and local laws and regulations governing mining operations and environmental protection. The Forest Service must provide for reasonably necessary mining activity while protecting and minimizing effects on other resources in accordance with regulations governing mining found in 36 Code of Federal Regulations (CFR) 228, Subpart A.

Surface Management Regulations (36 CFR 228, Subpart A)

The regulations require that operations conducted under the authority of the mining law which might cause significant surface resource disturbance must be covered by an operating plan approved by the Forest Service. Certain activities of little impact, generally non-mechanized disturbance, are specifically exempt from the operating plan requirements.

Montana Metal Mine Reclamation Act

The Forest Service works cooperatively with the Montana Department of Environmental Quality (DEQ). The DEQ administers the Montana Metal Mine Reclamation Act. The purpose of this law is to prevent land and surface water degradation by requiring lands disturbed by mining to be stabilized and reclaimed. The Act requires an approved operating permit for all mining activities which disturb more than 5 acres or mine more than 36,500 tons of ore annually. This law applies to all hardrock mining in Montana, regardless of whether it is proposed on Federal (non-Indian), State, or Private lands.

TECHNOLOGY

Advances in technology are expected to have a substantial effect on future mineral exploration and development. In light of these expectations, advances in geophysical and geochemical survey methods and procedures will take place at a rapid rate. Computerization of exploration data will increase as more sophisticated geologic modeling methods become available to the average user. Large advances in satellite imagery, and utilization of remote sensing data, will be made as more and better equipment are placed into orbit. The effect of these advances will be a more accurate and rapid evaluation of regional and local

areas with better discrimination of geologic targets, and a more accurate assessment of mineral deposit potential.

Mining and mineral processing efficiency will continue to improve in the future. This is due to advances in general technology becoming available to the mining industry. A large amount of knowledge will continue to be gained with experience. This may be especially true in the area of heap leaching technology which is barely two decades old. Reclamation has come of age in the last 15 years in response to growing environmental concern. Reclamation science will continue to advance as a result of experience and research. More detailed design effort will be placed on reclamation of mined lands in the future. This will result in an overall increase in reclamation costs. These costs should pay dividends in the long-term with increased reclamation success.

LEGISLATIVE CHANGES

There are several areas of potential legislative change that may affect how hardrock mineral resources are developed. The first is the ongoing effort to amend, repeal, or reform the General Mining Law of 1872. Since 1990, numerous bills have been sponsored by both parties in the Senate and House of Representatives. This effort could result in anything from simply leaving things as they are, to a complete restructuring into a leasing/royalty system similar to that now used for coal or oil and gas. The effect of major changes in the mining law on mineral activity could be a decrease in the amount of exploration activity undertaken by small operators. Another perhaps more extensive effect would be a decrease in the ultimate number and size of mines that could be developed. This is because a royalty on mineral production would generate a corresponding increase in operating costs which in turn would raise the cut-off ore grade making some currently economic deposits uneconomic, or reducing the size or mineable depth of other deposits.

Another area of possible legislative change is in environmental laws or regulations which would affect exploration and mining activity. There is an increased level of public awareness on environmental matters which is expected to continue into the future. Prevailing public attitude may result in stricter mine permitting requirements for state and federal agencies. The effect of more stringent requirements could be increased mine permitting and operating costs. This may cause some marginal operations to become uneconomic.

For purposes of analysis it is assumed that none of these potential legislative changes will have an appreciable affect

on the level, or amount, of mineral activities in the Cooke City area. It is also assumed that proposed operations will be scrutinized more thoroughly and compliance requirements will be subjected to higher standards in this area due to its proximity to Yellowstone NP, the A-B Wilderness Area, and the Clarks Fork Wild and Scenic River corridor.

COMMODITY MARKETS

Gold, copper, and silver are the commodities that are of interest to the mining industry in the Cooke City area at the present time. Supply and demand for these metals are discussed in this section. Other commodities that may be of interest in the future in this area are molybdenum, lead, and zinc. For the purposes of this analysis the price of these six commodities are assumed as follows, in 1996 dollars.

Gold	- \$400/ounce
Silver	- \$6.00/ounce
Copper	- \$1.20/pound
Molybdenum	- \$3.20/pound
Lead	- \$0.35/pound
Zinc	- \$0.50/pound

Supply and Demand for Gold. Gold is produced and used on a world- wide basis. Global gold supply in 1993 was estimated to be 3,538 tons (Gold Fields Mineral Services, Ltd., 1994). Mine production contributed about 65 percent of the supply, with official sales, gold scrap, and miscellaneous sources providing the remainder. Domestic mines continued to produce at near record levels during 1994, maintaining the United States' position as the world's second largest gold-producing nation, after the Republic of South Africa. U.S. production of 330 tons in 1994 account for about 15 percent of world-wide gold production (U.S. Bureau of Mines, 1995). In the U.S. in 1994, gold was produced from about 200 lode mines, about a dozen large placer mines, and numerous small placer mines.

The importance of gold as a store of wealth, including its role in world monetary systems, is the principal driving force that leads to efforts to find and produce more gold. From its use as an article of adornment, it grew to be a stable item of trade and eventually became what is now called money.

With the organization of industrialized nations and the development of international commerce, gold became the primary instrument for settlement of international debt, whether used in direct payment, or as backing (officially or de facto) for national currencies. Thus, gold is accumulated and held as reserves by national banking institutions, the so-called central banks.

Of the total gold available in the world today - which represents virtually all the gold that has ever been mined - about one-third is held by national central banks and other official agencies, such as the World Bank and the International Monetary Fund, as a support for monetary systems. Another third is held in private hoards, as a hedge against inflation and sudden domestic or international instabilities, or for speculation purposes. The other third is in jewelry (in some respects a store of wealth) and in other fabricated uses such as in the electronic industry and dentistry (USGS, 1988).

Supply and Demand for Copper. Since 1980, U.S. consumption of refined copper has ranged from 1.8 to 2.4 million tons (Marshall, 1993). Worldwide consumption of copper reached 10.8 million metric tons in 1991. Electrical uses are the dominant domestic copper use; consumption of copper in electrical applications has increased both in absolute and relative terms (Marshall, 1993). Other copper uses, such as in construction, machinery, and transportation, have remained stable or decreased during the past decade.

In 1994, domestic copper production from mines was 2 million tons, continuing a decade-long upward trend. About 50 copper mines operated in the U.S. in 1994. Recycled copper from old scrap in 1994 provided about 20 percent of apparent domestic consumption. World copper production was an estimated 9.3 million tons (U.S. Bureau of Mines, 1995).

Supply and Demand for Silver. U.S. demand for silver has decreased since 1985, with apparent U.S. demand for silver decreasing from about 7,000 tons in 1985 to 4,500 tons in 1994 (U.S. Bureau of Mines, 1995). Net imports of silver also decreased from 4,500 tons in 1985 to 2,200 tons in 1994. An estimated 2,200 tons of silver was recovered from recycled materials in 1994. Photography continued to be the largest single use of fabricated silver, accounting for just over 50 percent of the total demand. Electronics and batteries comprised about another 20 percent to total demand. Jewelry, silverware, coins, and miscellaneous other uses accounted for the remaining demand (U.S. Bureau of Mines, 1995).

Silver was produced by about 120 mines in 18 states. Total domestic mine production in 1994 was an estimated 1,400 tons. In the U.S., more silver was recycled from old scrap in 1994 than mined. World silver production was an estimated 14,000 tons (U.S. Bureau of Mines, 1995).

HISTORICAL AND CURRENT MINERAL ACTIVITIES

The first discovery of valuable minerals in the Cooke City area was in 1869. In 1870, prospectors located claims on Miller Mountain and Republic Mountain, to the north and south of Cooke City, respectively. During the period of 1875 to 1887, small amounts of lead, silver, and zinc were produced from the New World mining district. From 1888 to about 1930, copper-gold ore was produced sporadically from several small mines and prospects that included the Little Daisy, Homestake, Glengarry, and Alice E. mines. The Republic mine was also worked intermittently during 1906-20. During 1920-52, the Irma and Republic mines were small but consistent producers of lead-zinc-silver ore. Several other properties, including the Homestake mine, had minor to moderate production during the 1940's and 1950's.

The most significant production in the district came from the McLaren Gold mine, which commenced small-scale operations in 1933. The mine was a consistent producer from about 1938 to 1953, when the mill burned and the mine closed.

The total reported production for the New World district is 62,311 ounces of gold; 692,386 ounces of silver; 1,963,800 pounds of copper; 3,242,615 pounds of lead; and 920,200 pounds of zinc. Nearly all of the gold and copper came from the McLaren Gold mine (Elliott, et al, 1992).

Several companies explored the New World district for large tonnage porphyry copper-molybdenum deposits from

1962-1982. The Como gold-copper-silver deposit was identified and drilled during the period 1962-1973. Subsequent drilling during 1981-1982 identified probable reserves of 435,700 tons containing 0.170 opt Au, 0.75 opt Ag, and 1.31 pct Cu in the Como area (Elliott, et al, 1992).

Exploration since 1987 has focused on identifying resources in sediment-hosted skarn and replacement deposits (i.e., concentrations of minerals formed by reactions of cooling magma with limestone) adjacent to altered and weakly mineralized intrusions.

MINERAL POTENTIAL

Discovered Ore Deposits

In 1987 Crown Butte Mines, Inc., identified new reserves in the McLaren deposit area. Exploration drilling led to discoveries of the Fisher Mountain deposit in 1988, the Miller Creek deposit in 1989, and the Homestake deposit in 1990. Total exploration and development drilling by Crown Butte between 1987-92 is 295,375 feet in 824 holes. Geologic ore reserves defined by Crown Butte are shown in Table B-1 and Figure B-1.

A significant shift in the ratio of open pit to underground reserves took place as a result of drilling in 1990-91. Prior to 1990, all of the reserves were contained in the open pit reserves of the Como and McLaren deposits. However, underground reserves currently account for 73 percent of the tonnage of ore and 87 percent of the contained gold (Elliott, et al, 1992).

TABLE B-1. GEOLOGIC ORE RESERVES IN GOLD-COPPER-SILVER DEPOSITS, NEW WORD DISTRICT (ELLIOT, ET AL, 1992)

Deposit	Tons	Ounces Au	Pounds Cu	Ounces Ag
Como	707,318	77,805	14,570,750	386,195
Fisher Mtn	334,200	63,164	1,871,520	377,646
McLaren	2,171,035	197,564	30,394,490	827,164
Miller Cr	2,218,368	858,508	38,599,603	3,416,286
Homestake	6,600,966	1,478,616	93,733,717	5,478,801
Average grade		0.222 opt	0.75 pct	0.870 opt
Total	12,031,887	2,675,657	179,170,080	10,486,092

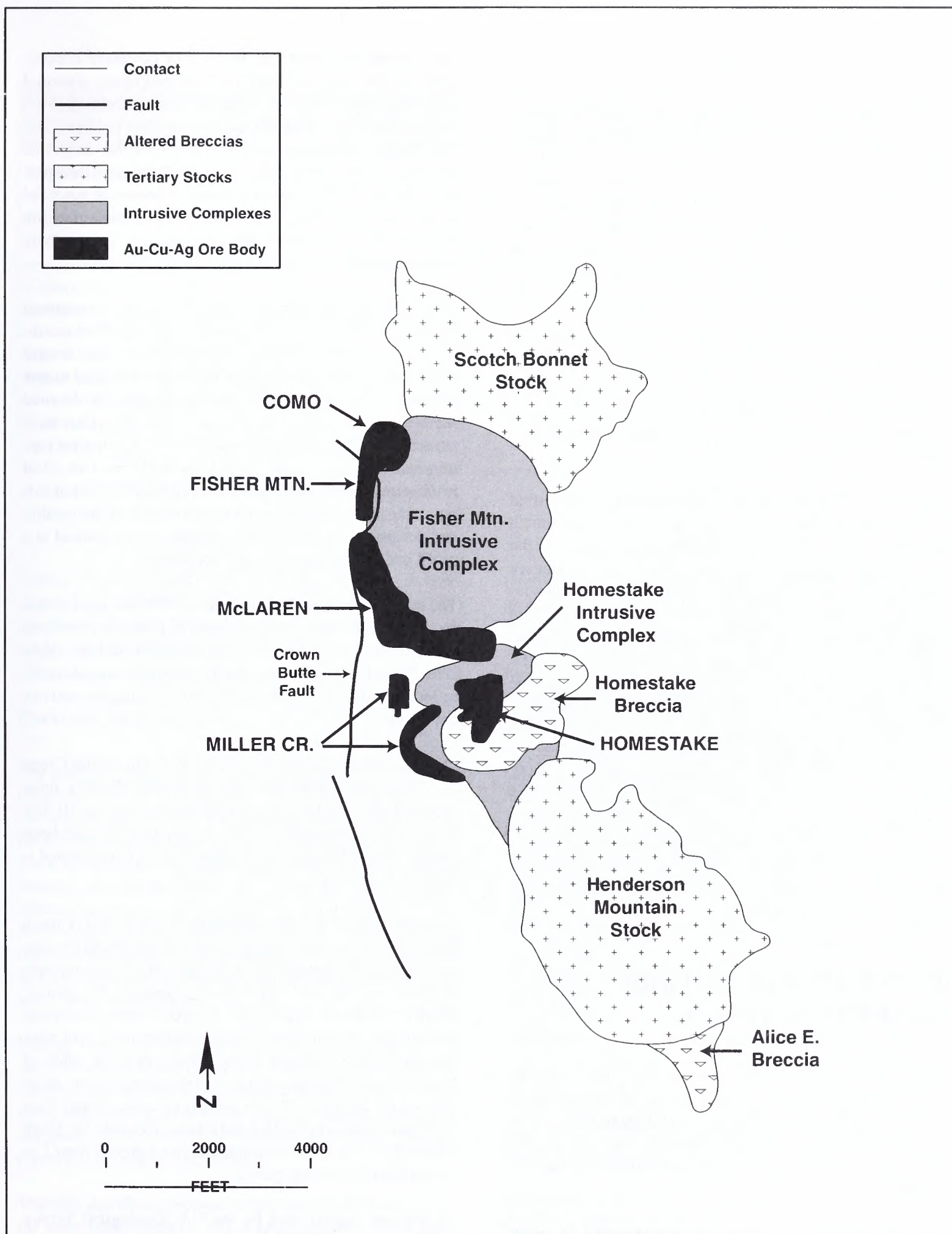


FIGURE B-1. Map showing the locations of identified gold-copper-silver ore deposits, main intrusive complexes and stocks, and breccia pipes (after Elliott et al, 1992).

Undiscovered Ore Deposits

Undiscovered ore deposits are likely to be similar to gold-copper-silver skarn deposit types that have been discovered recently and polymetallic base metal (lead, zinc, & silver) vein deposit types that have been mined in the past. Deposits mined or explored in the past for copper have the potential to be reexamined for precious-metal (gold and (or) platinum) potential. Reworking of old placers and reevaluation of previously delineated placer gold occurrences are a possibility.

Other mineral deposit types present in the area are less prospective at the present time because of economic factors. Porphyry copper deposits may be too low grade (depending on trends in copper prices) to be mined only for copper, but may be examined for other commodities such as gold.

The U.S. Geological Survey (USGS, 1993) has identified 10 mineral resource tracts (i.e., areas that represent a synthesis of the current state of geologic knowledge of the New World mining district) within the study area that are permissive for the occurrence of various types of undiscovered mineral deposits. Many areas that were explored in the past, mainly for copper and molybdenum were not thoroughly evaluated for their gold or platinum group potential at that time. Other commodities of possible interest include nickel, arsenic, lead, zinc, silver, and iron. The more favorable areas within permissive tracts equate to high occurrence potential for undiscovered ore deposits as defined by the BLM for this analysis (Maps B-1, B-2, B-3, and B-4). With the exception of the Kersey Lake extension, all of the study area possesses high occurrence potential for one or more ore deposit types. Areas where potential porphyry copper-gold-molybdenum deposits overlap skarn deposits and polymetallic vein deposits are considered to have the highest occurrence potential.

FORECAST FOR FUTURE MINERAL ACTIVITY

Reed (1950) indicates that prior to 1950, there were 13 mines in the New World Mining District. All of these mines were relatively small underground precious and base metal operations with the exception of the McLaren open pit gold and copper mine - the most significant producer in the area to date.

Presently, the area of high occurrence potential for gold-copper-silver skarn deposits (Map B-1) possess high development potential, (Map 3-11). In addition, the favorable

area for undiscovered ore deposits of porphyry copper-gold-molybdenum exhibits high development potential (Map B-2, Map 3-11). Polymetallic vein occurrences (Map B-3) exhibit high or moderate development potential and the alkaline gabbro-syenite tract (Map B-4) has moderate development potential (Map B-1). By definition, development potential relates to a mineral occurrence or potential occurrence that is likely to be explored or developed within the next 20 years given the geologic and nongeologic assumptions and conditions specified in this report.

Mineral exploration is based on the premise that an eventual discovery will result in a mine that makes the effort worthwhile. As a generalization, statistics show that several hundred favorable sites for ore mineralization lead to one orebody. If indications are strong enough for detailed surface investigation, the odds are 1 in 100; if a site is attractive enough to drill, the odds are 1 in 50; after ore-mineralization has been verified, the odds are 1 in 10 of finding an orebody (Peters, 1987). For the purposes of this report the terms orebody and mine are used interchangeably and defined as "a mineral deposit that can be worked at a profit under existing economic conditions".

The statistics borrowed from Peters, 1987, are used in this forecast to illustrate relative probabilities for the combined future mineral activity that could occur within the study area (Table B-2). These numerical values do not necessarily reflect the odds or percent probability of a singular activity occurring.

Ore reserves are displayed in Table B-1. The Miller Creek and Homestake deposits make up Crown Butte's mine proposal and the odds of mining are greater than 1 in 10. The Como, McLaren, and Fisher Mountain deposits have been extensively drilled and their probability of being mined is 1 in 10.

In addition to ore reserves identified in Table B-1, Crown Butte Mines, Inc. conducted an extensive exploration program from 1989 through 1993 in search of mineral deposits of gold, copper, and silver in the New World mining district. Of the 12 exploration targets, 7 were dismissed without any drilling and 4 were discontinued with only limited drilling (FS and DEQ, 1996), thus the odds of locating an orebody as a result of this exploration are more speculative than 1 in 50. The remaining target (Daisy Pass Pod) was extensively drilled and is being evaluated as Stage 2 reserves in the mine proposal and has a greater than 1 in 10 likelihood of being mined.

Descriptive models used by the U.S. Geological Survey (USGS, 1993) to identify favorable areas for undiscovered ore deposits in this area are based on very little if any drillhole data. The forecast assumes that 10 exploration

TABLE B-2 - FORECAST FOR FUTURE MINERAL ACTIVITY

	Estimated Size	Estimated Duration	Estimated Number	Forecast Probability*
Exploration	< 1 ac.	Continuous	NA	>> 1 in 10
Exploration (drilling)	4 ac.	2-3 yrs.	10	> 1 in 10
Crown Butte (proposed mine)	180 ac.	12-20 yrs.	1	> 1 in 10
New Mine (open pit)	200-400 ac.	8-15 yrs.	1	1 in 10
New Mine (underground)	75-200 ac.	8-15 yrs	1	> 1 in 50

* Relative probability (see text for discussion)

drilling programs could occur within the next 20 years and that drilling could identify 1 underground mine, thus the likelihood of a mine occurring in the future based on these models and the drilling forecast is greater than 1 in 50.

Forecast Summary

The geologic setting, past activity, the Crown Butte mine proposal, and the large number of patented (~3,315 acres) and active unpatented (~4,331 acres) claims indicate continued exploration is highly likely to occur throughout the study area. The relative interest of this area to the minerals industry and its potential for mineral development will depend largely on commodity prices and social concerns more so than geologic factors. Forecasts derived in this report (Table B-2) are based on the author's examination and assessment of these combined geologic and non-geologic factors and conditions.

Mining targets in the near future are likely to focus on precious metal deposits and may shift to base metals in combination with precious metals. High capital-investment, medium to large scale, underground mining will dominate industries interest. Medium-scale bulk tonnage (open pit) mining is a possibility.

The only significant producer in the area, the McLaren open pit mine (gold-copper), was a small-medium sized bulk tonnage operation that ran for 15 years before closing in 1953. Crown Butte Mines, Inc. began exploring in the late 1980s and is currently in the process of permitting (permit-

ting is presently suspended) a small to medium-size underground gold-copper-silver mine with a 12-20 year mine life. Assuming similar or more refined exploration technology in the future and similar or more stringent mine permitting requirements, along with stable gold prices and/or increases in base metal prices, there is varying probability (Table B-2) that one of each medium-sized underground and open pit metal mine (in addition to Crown Butte's proposal) could be developed within the proposed withdrawal area in the next 20 years.

Undiscovered deposits that may lead to mines would likely occur west of the easternmost boundary of where skarn deposits have high occurrence potential (Map 3-11) and most likely within the area overlapped by porphyry copper-gold-molybdenum potential. For analysis purposes, based on typical present-day mining operations, it is assumed that any underground or open pit mine in the area would disturb approximately 75-200 and 200-400 acres, respectively, with a mine life of 8-15 years each. About 200 workers would be employed at each mine during full production. Long-term total payroll at each mine would be \$6.5 million per year, in 1996 dollars. Due to the amount of lead time needed for exploration and permitting, neither of the two hypothetical new mines are likely to be in full operation at the same time or within the next eight years.

Exploration is forecasted to take place continuously for the projected future, consisting mainly of mapping, and geochemical and geophysical surveys, all of which create negligible surface disturbance. There is a potential for 10 drilling programs averaging 20 drillholes each and 4 acres

of disturbance each (including access). Portable track-mounted or buggy-mounted drill rig and some helicopter use could be expected. Development drilling may occur and could include 700 holes for each of the 2 new mines that are forecasted.

Custom mills and/or on-site smelters are not foreseen. The two hypothetical mines that are forecasted may utilize Crown Butte's proposed infrastructure, such as the powerline, work camp, and buildings, thus reducing capital costs and acres of disturbance.

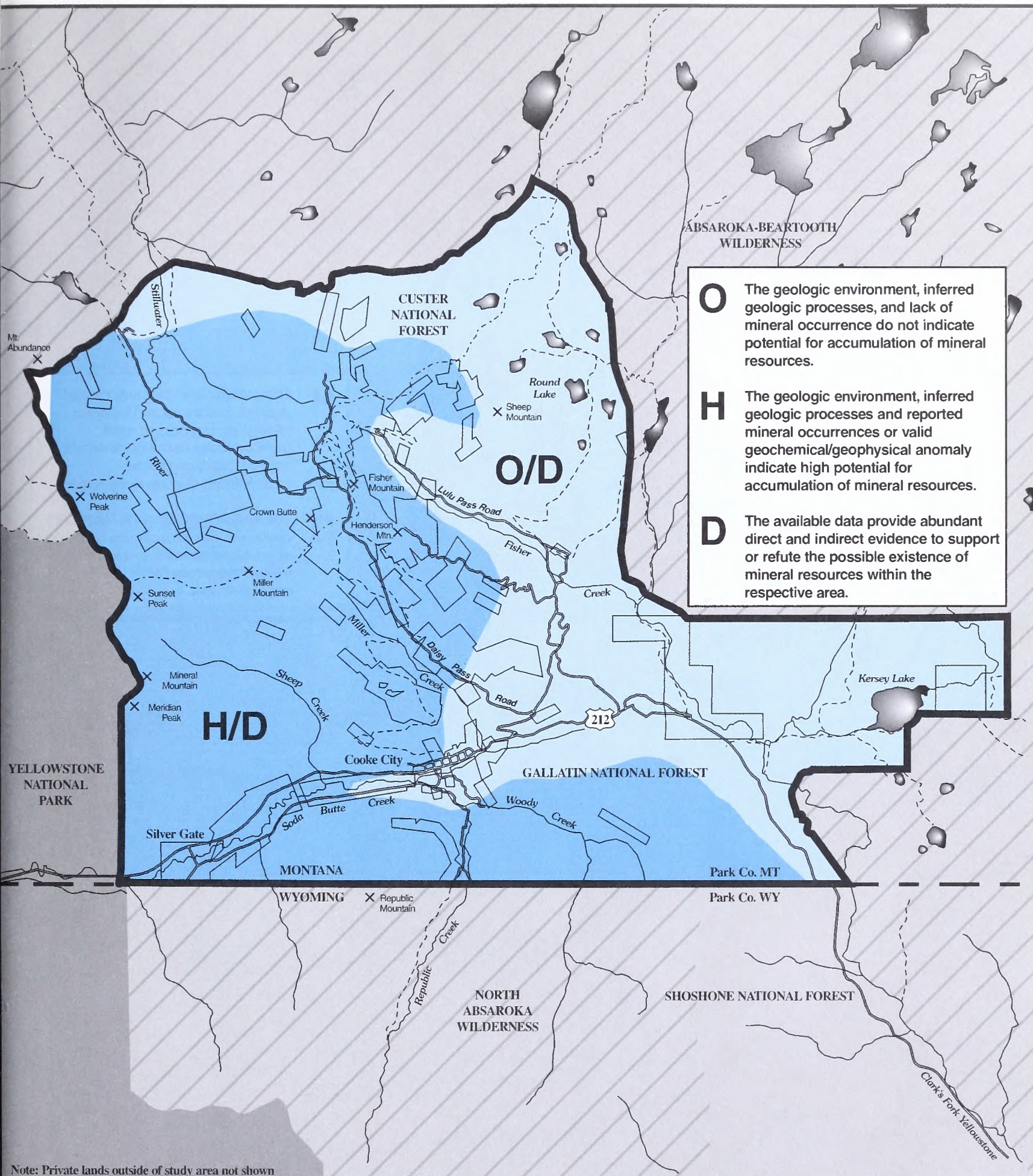
The probability of this future exploration and mining activity occurring on patented land within the 22,000 acre study area is greater than on NF lands given the area with the highest mineral potential contains the highest density of patented claims (see Land Status in this report) and the fact that, by definition, patented claims are mineralized. However, most lands within the study area have varying degrees of high occurrence and development potential, thus, available federal lands would increase the odds of finding orebodies and industry interest in federal land is expected to continue.

The above forecast reflects the current management situation identified in the Gallatin and Custer Forest Plans that

provide for claim staking, exploration, and mining under the General Mining Law of 1872. In the event of a withdrawal about 4,240 acres of active claims (272 lode, 202 mill sites, and 3 placer claims) would be subject to existing rights which would allow mining activity on valid claims. In addition, mining activities would be allowed to continue on approximately 3,315 acres of patented mining claims within the study area.

The mining law provides extralateral rights to the owner of patented lode claims and valid unpatented lode claims. These rights belong to such lode claims for mineralized veins that apex within a claim and extend downward beyond the claim's vertical limits. In the event of a withdrawal, extralateral rights may extend the frontier of future mining activity beyond the boundaries of patented or valid unpatented lode claims, however, surface rights do not extend beyond the vertical limits of the actual claim and surface disturbance would most likely be confined to the actual claim.

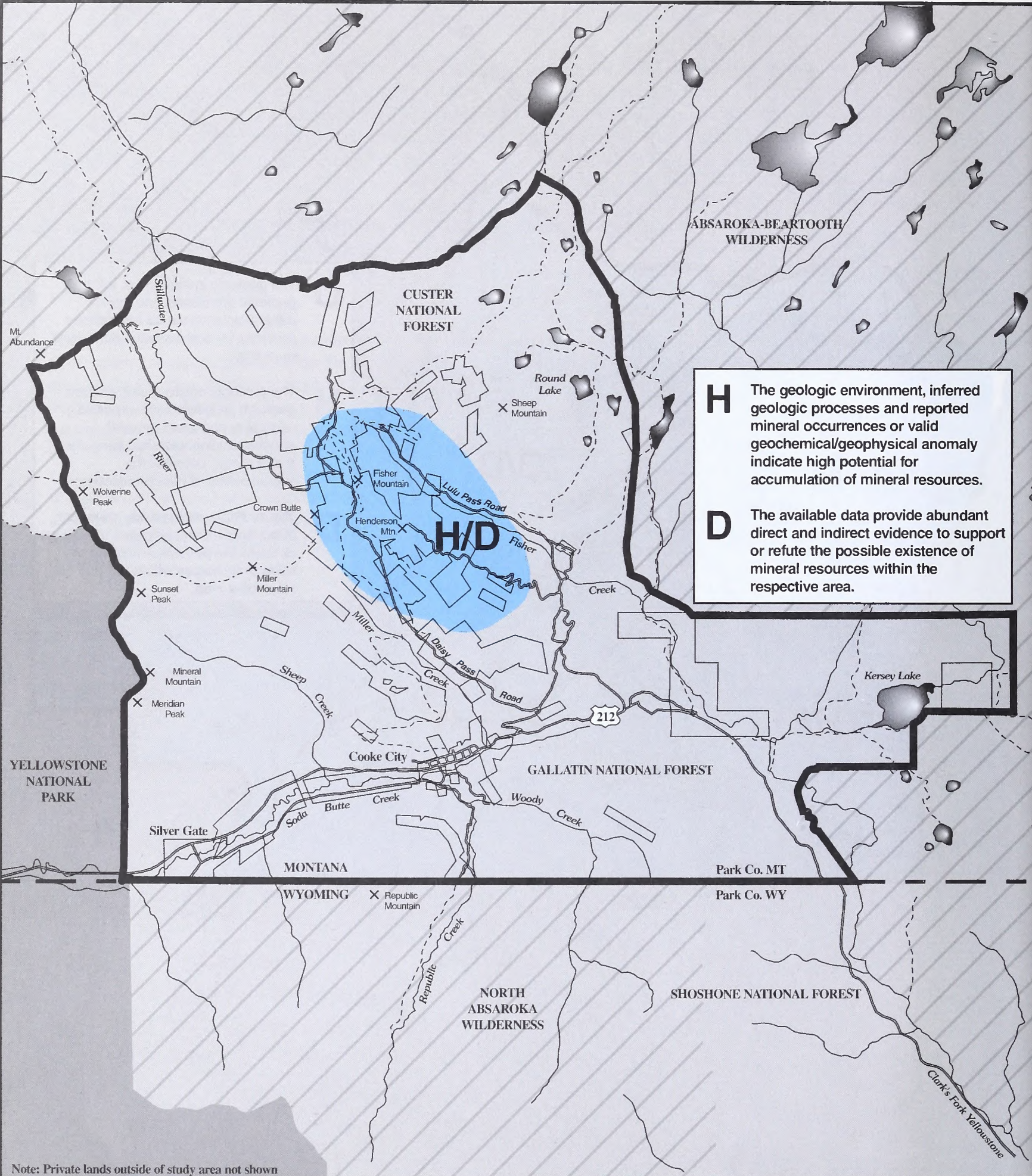
For NEPA analysis purposes only, it is assumed that most current unpatented claims will not be developed and that extralateral rights will not significantly extend mining activity beyond the boundaries of patented claims or any unpatented claims with valid existing rights.



		Yellowstone National Park		Study Area Boundary
		Wilderness		Streams
		Private lands (not subject to withdrawal)		Trails
		National Forest Land		Roads
				National Forest Boundary

MAP B-1

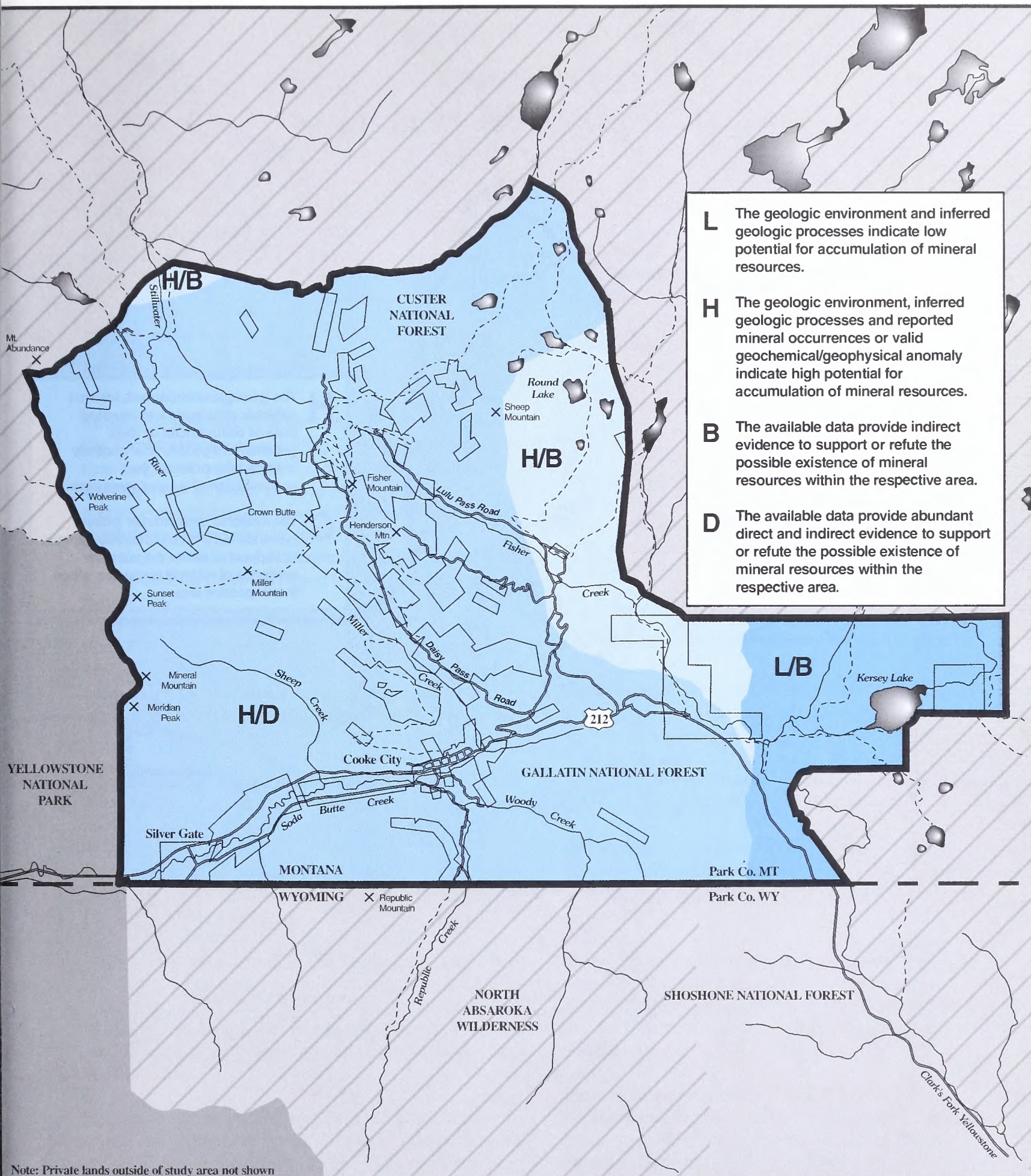
OCCURRENCE POTENTIAL FOR SKARN-REPLACEMENT DEPOSITS



		Yellowstone National Park		Study Area Boundary
		Wilderness		Streams
		Private lands (not subject to withdrawal)		Trails
		National Forest Land		Roads
				National Forest Boundary

MAP B-2

OCCURRENCE POTENTIAL FOR PORPHYRY COPPER-GOLD-MOLYBDENUM



MAP B-4

**OCCURRENCE POTENTIAL
ALKALINE GABBRO-SYENITE
HOSTED COPPER-GOLD-
SILVER-PGE DEPOSITS**

Legend:

- Yellowstone National Park
- Wilderness
- Private lands (not subject to withdrawal)
- National Forest Land
- Study Area Boundary
- Streams
- Trails
- Roads
- National Forest Boundary

APPENDIX C

SUMMARY OF ASSUMPTIONS

The following assumptions were used in addition to the mineral development forecast contained in Appendix B and summarized in Table 2-2 as a basis for predicting environmental consequences of each alternative and development scenario.

Mineral Development Forecast

Mining: Mining related actions would include: **Prospecting, Exploration** (access, drilling, geophysical exploration, trenching, pits, underground exploration, bulk sampling), **Development** (drilling, develop shafts and adits, access, power, communications, mine and mill site preparation), **Production** (underground and surface methods, ore dressing, wastes, roads), and **Reclamation**. (See USDA Forest Service General Technical Report INT-35 for a discussion of these actions.)

Maps 2-1, 2-2, 2-3, and 2-4 show where mining activities are most likely to occur for each scenario. It was assumed that little or no mining related activities would occur in the low or moderate development potential areas except for mill sites and work camps.

Development of the New World Project is assumed to be reasonably foreseeable. Development of other mines is more speculative. No mining is assumed with Scenario B-2.

Mine reclamation activities for Scenario A-1 and Scenario B-1 would include plugging or treating water from Glengarry adit and Gold Dust adit.

Mine reclamation activities for Scenario A-2 and Scenario B-2 would include reclaiming McLaren and Como pits, plugging or treating water from Glengarry adit and Gold Dust adit, abandoning and reshaping road beds, reclaiming abandoned mine exploration, and reclaiming old tailing piles in Fisher Creek.

Powerline Construction: A 69 kV powerline from Cody to a new substation near Cooke City would be constructed when the first mine is developed. The route would generally follow the existing 14.4/24.9 kV distribution line that runs from Cody to Cooke City. A 24.9 kV segment would probably be built from the substation to each mill site.

Highway 212 and Highway 296: Highway 212 would be plowed to remove snow and to allow trucking supplies and busing employees between Cooke City and Cody year round. The mine(s) would pay for plowing the road to guarantee year round access. Mining related operations would result in daily truck traffic on Highway 296 and 212. Tailings may be hauled to a location(s) in MT or WY. There would be a significant increase in truck traffic on area highways.

Employee Residency: The majority of employees would establish residency in surrounding communities (e.g., Cody, Powell, Gardiner, Livingston, others). Most employees would be bused to the mine sites and work camps from their community of residence for their one to three week work shift. Some additional housing construction would be anticipated in Cooke City and Silver Gate.

Other Reasonably Foreseeable Activities

Highway Construction: Within a 20-year period, the highway between Mammoth and Cooke City as well as the highway between Cooke City and Cody would be upgraded. The construction periods would occur between April and November. At least one sand and gravel pit is expected to be developed within the study area.

Recreation Use and Trends: Recreation use in Yellowstone National Park and surrounding areas would continue to increase. Mining would cause some recreation use to be displaced.

Water Rights: Surface water and groundwater rights within Soda Butte Creek Drainage appear to be fully appropriated. Additional development within that drainage will be limited unless water rights are purchased from an existing user or diverted from another drainage.

Residential Development: Demand for private land within the study area has been increasing. Three or four homes/cabins have been built per year. This also results in an increased demand for access to inholdings. This trend is anticipated to continue in the future.

APPENDIX D

LANDSCAPES, SOILS, AND VEGETATION

Landscapes

Landscapes are combinations of the earth's features that are important to potential uses. They affect the kinds of ecosystems present in the area, and their response to various management scenarios. Landscapes in the Withdrawal Area (Map D-1) range from barren, high peaks and tundra-covered plateaus to rolling forested slopes. Elevation ranges from 7400 feet to above 10,000 feet, and includes some of the highest and coldest lands in the Greater Yellowstone Area, as well as moderately productive forest lands similar to many commercial timber lands in the Gallatin National Forest. The northern one-half of the area has an alpine look, with the southern one-half primarily in a forested environment. A description of those landscapes is summarized in Table D-1.

Soils

Soils in the study area range from very sandy to moderately clayey. Most have either a glacial or alluvial origin, and are relatively young (less than 8,000 years old). They have weakly expressed horizons (layers). Soil distribution is shown in Map D-2. The northern one-third of the area is characterized by coarse textured, rocky soils with low potential productivity and high erodibility. They have light-colored surface layers, and may be shallow to bedrock. They make up 14,088 acres, or 54% of the study area.

Medium textured soils occur in the eastern one-half, near Wolverine Mountain. They have formed in glacial till derived from extrusive volcanic rocks. These soils have high potential productivity but are highly susceptible to compaction and smearing when wet. They make up 2,247 acres or 9% of the study area.

Soils in the lower one-third of the area and along Abundance Creek have high clay content and are potential sediment sources. They make up 7,094 acres or 27% of the study area.

Wet soils with a variety of textures occur near streams and above Kersey Lake. They, with interspersed drier soils, make up 2,395 acres or 9% of the study area.

Soils in the central portion of study area have been affected by past mining activities. Acid-producing rock materials

have been exposed at the surface, producing highly acid soils with little productive capacity. Soil pH can be as low as 2.5 in these areas. A somewhat larger surrounding area, primarily near Henderson Mountain, contains soils that naturally contain these acid-producing rocks. Here soil pH can be as low as 3.4. These areas have low plant productivity. Most of the remainder of the Withdrawal Area contains soils with normal properties, due to natural soil buffering of acids, absence of acid-producing rocks, or weathering processes. They are moderately productive at lower elevations, and generally have low productivity in the remainder of the area.

Vegetation

Vegetation ranges from high alpine turf and tundra to moderately productive forest, though most of the area is dominated by turfs and scattered, high elevation forest. Distribution is shown in the Map D-3.

Alpine turf occurs at the highest elevations. It is characterized by low growing grasses and forbs with very low productivity. Results of disturbance can easily be visible for 50 to 100 years. This vegetation type makes up 5,764 acres or 22% of the study area.

Upper subalpine forest occurs throughout the area at elevations above 8,000 feet. Common plant species are whitebark pine, sub-alpine fir, lodgepole pine, and grouse whortleberry. Productivity is low and reforestation potential is low. These are generally non-commercial areas, with the exception of some stands east of Cooke City. This vegetation type makes up 9,098 acres or 35% of the study area.

Lower subalpine forest occurs in the eastern portions of the study area on the slopes above Cooke City and north of Kersey Lake. Common species are sub-alpine fir, lodgepole pine, and grouse whortleberry. Productivity is moderate and reforestation potential is high. This vegetation type makes up 2,834 acres or 11% of the study area.

Meadows and sparse upper subalpine forest occur on steep slopes interspersed with non-vegetated rock rubble. Common plants are meadow forbs and grasses, whitebark pine, and sub-alpine fir. Productivity is very low, and reforestation potential is low. Results of disturbance can easily be visible for 50 to 100 years. This vegetation type makes up 8,884 acres or 25% of the study area.

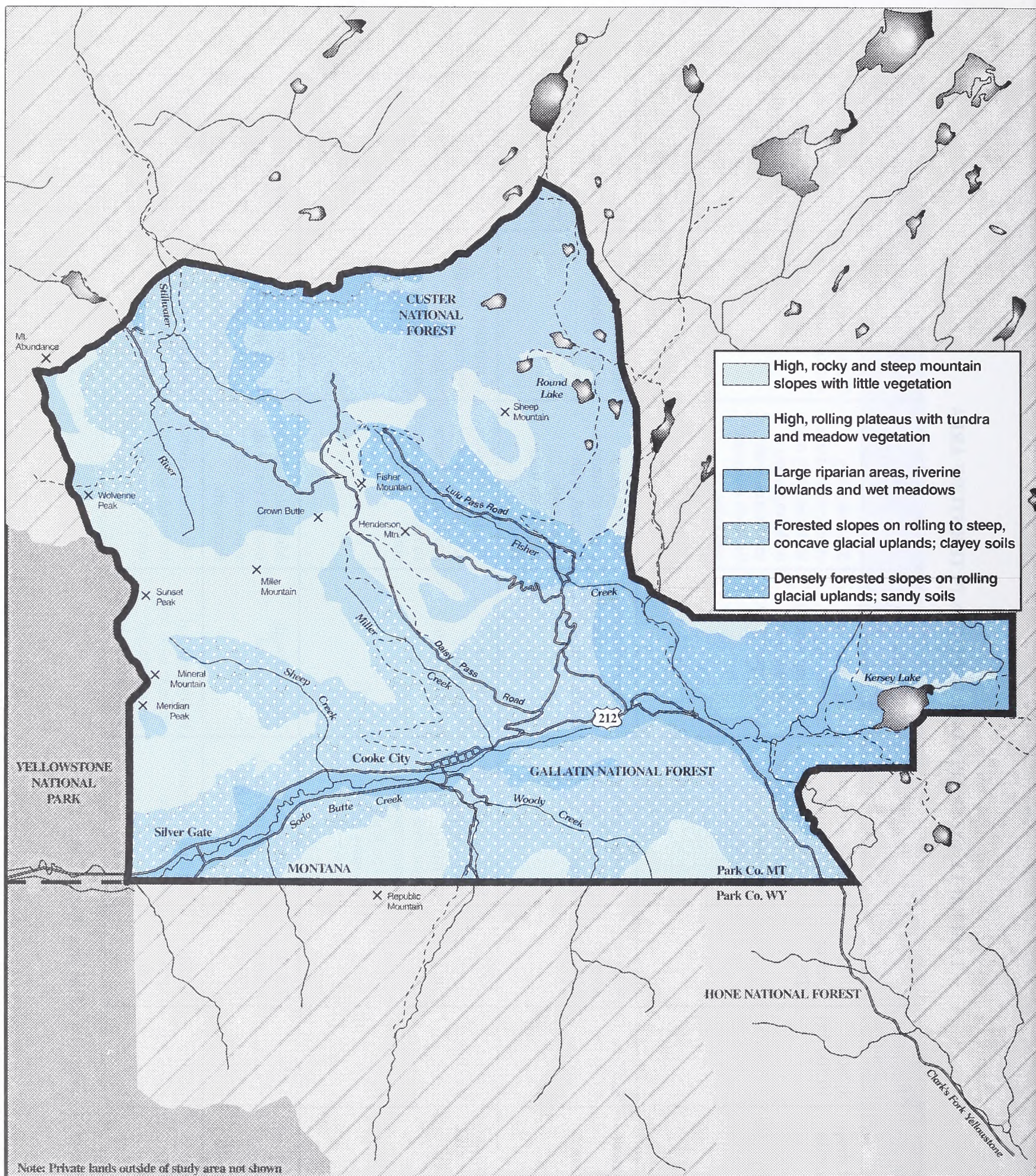
Riparian and forest vegetation occurs near stream courses and in alluvial basins.

Willows, sedges, and grasses are interspersed with spruce, lodgepole pine, and sub-alpine fir. Productivity is high to moderate and revegetation potential is high. This vegetation type makes up 2,395 or 9% of the study area.

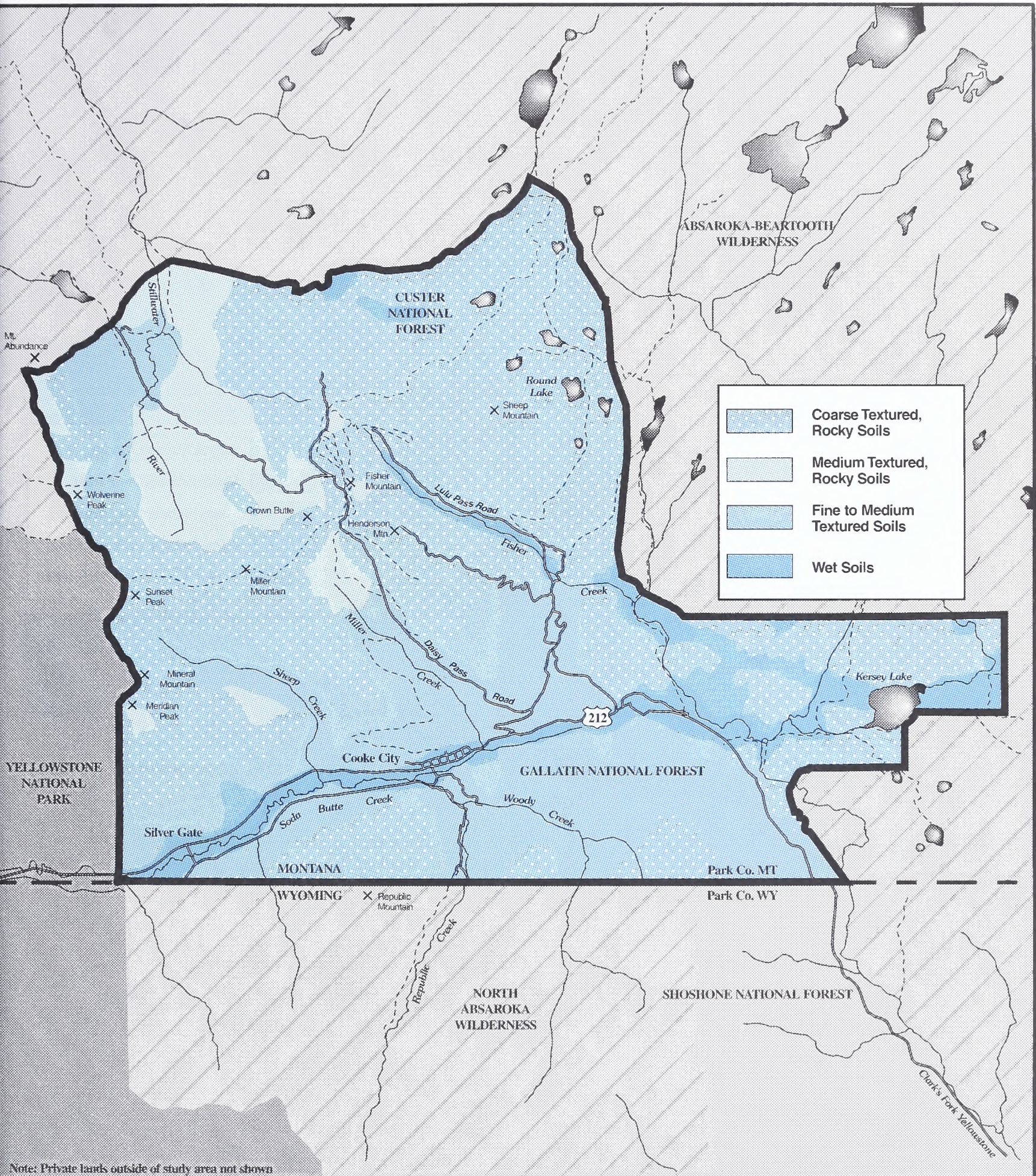
TABLE D-1 LANDSCAPES DESCRIPTIONS IN THE STUDY AREA

Landscape	Elevation Range	Area	Location	Landforms	Soils	Vegetation	Rock Types
High, rocky and steep mountain slopes with little vegetation	8,200 to 10,500 feet	5,732 acres or 22%	Middle of the study area, forming a spine of peaks along the Gallatin National Forest boundary.	Steep, relatively concave slopes, including glacial troughwalls and headslopes.	Shallow, very coarse to medium textured, with many rock fragments intermixed with bedrock outcrops and talus.	Timberline forest and meadows.	Hard metamorphic rocks throughout most of the area, volcanic rocks in the west, and limestone with sandstone near the McLaren pit and Henderson Mountain.
High, rolling, plateaus with tundra and meadow vegetation	8,600 to 9,800 feet	5,764 acres or 22%	Mid to northern portion of the study area.	Rolling plateaus and broad glacial cirque bottoms.	Shallow, very coarse to medium textured, with many rock fragments intermixed.	Meadows, tundra, sparse timberline forest.	Primarily hard, metamorphic rocks with some extrusive volcanic rocks.
Large riparian areas: riverine lowlands and wet meadows	7,400 to 9,800 feet	2,395 acres or 9%	Scattered throughout the area, primarily along major river or stream corridors and on high plateaus in the northern part of the study area.	Valley stream bottoms and alluvial basins.	A mixture of wet, silty soils and dry, moderately coarse to medium textured soils.	A mixture of riparian vegetation, sedge, willow, subalpine fir and lodgepole pine.	Mixture of rocks.
Forested slopes on rolling to steep, concave glacial uplands; clayey soils	7,400 to 8,000 feet	7,879 acres or 30%	Primarily in the southern two-thirds of the study area.	Glacial trough bottoms and sideslopes.	Moderately fine to medium textured, with many rock fragments.	Dense lower to upper subalpine forest, intermixed with meadows.	Sandstone and shale; extrusive volcanic rocks.
Densely forested slopes on rolling glacial uplands; sandy soils	7,800 to 9,700 feet	4,053 acres or 16%	Eastern one-third of the study area.	Rolling glacial uplands with some steeper glacial trough mid-slopes.	Moderately coarse textured, with many rock fragments.	Dense to sparse forest intermixed with meadows.	Hard metamorphic rocks and granite.

Water makes up about 117 acres or 1% of the area (Kersey Lake).

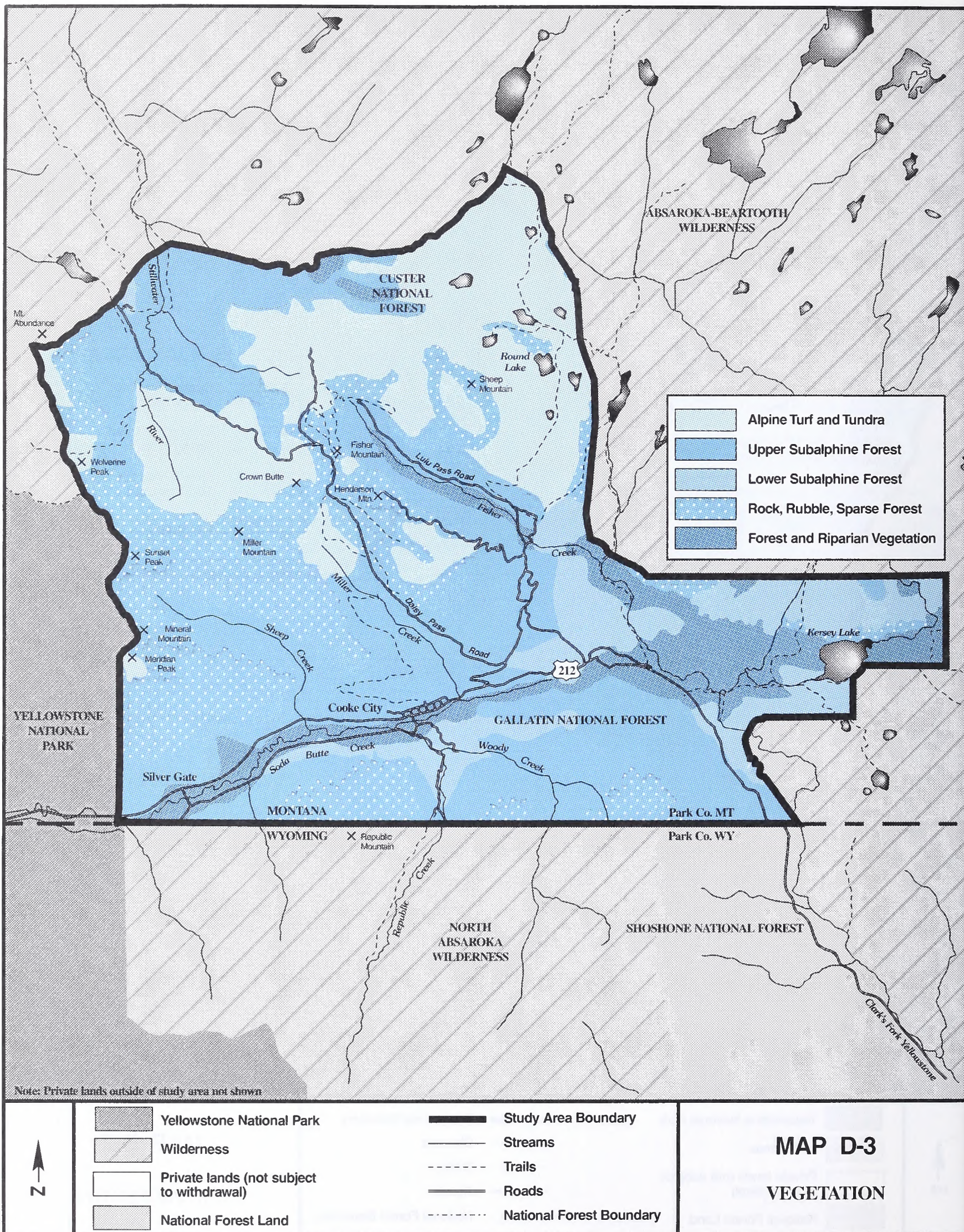


	Yellowstone National Park	Study Area Boundary	MAP D-1 LANDSCAPES
	Wilderness	Streams	
	Private lands (not subject to withdrawal)	Trails	
	National Forest Land	Roads	
		National Forest Boundary	



MAP D-2

SOIL PROPERTIES



APPENDIX E

BIOLOGICAL ASSESSMENT

(Federally Threatened and Endangered Species)

Prepared by: Don Sasse, Wildlife Biologist, USFS

INTRODUCTION

Project

An environmental impact statement has been prepared which describes and evaluates the management alternatives for the proposed Cooke City Area Mineral Withdrawal. The study area is located within Park County, Montana on the Gallatin and Custer National Forests.

The purpose of this biological assessment is to review the possible effects of the preferred alternative on Federally listed endangered or threatened species and their habitats in order to determine whether or not a "likely to adversely affect" situation exists. If the preferred alternative affects threatened or endangered species other than those described here, or if new information becomes available that would change the effects analysis, a new or revised BA will be needed. The DEIS preferred alternative is Alternative B, Mineral Withdrawal.

Coordination with the USFWS

In accordance with Section 7 of the Endangered Species Act, a request was made to the U. S. Fish and Wildlife

Service for a list of federally-listed threatened, endangered and candidate species that should be considered in the Biological Assessment for the proposed Cooke City Area Mineral Withdrawal (Thompson and Timchak September 4, 1996a; Thompson and Timchak September 4, 1996b). The USFWS responded for Montana (McMaster, September 16, 1996) and the Wyoming Field Office concurred with the list supplied by the Montana Field office of the USFWS (Davis, October 30, 1996). It was determined that the grizzly bear (resident), gray wolf (resident, transient), bald eagle (resident, transient), and peregrine falcon (resident migrant) were the threatened and endangered species that may be present in the study area (Table E-1). No proposed species (see discussion below on the status of the gray wolf) or category 1 candidate species were included. No critical habitat has been designated or proposed in the project area.

New direction was provided regarding the gray wolf. On November 22, 1994, the USFWS published final rules in the Federal Register designating wolves reintroduced in Yellowstone National Park as nonessential experimental populations. Wolves designated as nonessential experimental, that are not within units of the National Park or National Wildlife Refuge systems, are treated as proposed species for Section 7 purposes.

TABLE E-1. FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES PRESENT¹

Common Name	Scientific Name	Federal Status	Expected Occurrence
Grizzly bear	<u>Ursus arctos horribilis</u>	Threatened	Resident
Gray wolf	<u>Canis lupus</u>	Nonessential Experimental ²	Resident, transient
Bald eagle	<u>Haliaeetus leucocephalus</u>	Threatened	Resident migrant
Peregrine falcon	<u>Falco peregrinus</u>	Endangered	Resident, migrant

¹Identified in coordination with the USFWS (McMaster, September 16, 1996).

²New direction was provided regarding the gray wolf. On November 22, 1994, the USFWS published final rules in the *Federal Register* designating wolves reintroduced in Yellowstone National Park as nonessential experimental populations. Wolves designated as nonessential experimental that are not within units of the National Park or National Wildlife Refuge systems are treated as proposed species for Section 7 purposes.

AFFECTED ENVIRONMENT

This section describes the rationale for probability of occurrence.

Grizzly Bear (Threatened) - Greater Yellowstone Area (GYA)

Overview

A self-perpetuating grizzly bear population exists within the Greater Yellowstone Area. Because the grizzly bear is a threatened species, the USFWS has prepared and implemented a recovery plan. The future of the Yellowstone grizzly bear is uncertain and controversial. Trend data indicates that following a decline caused by the closure of open garbage dumps in 1970 and 1971, the grizzly bear population is now increasing. It is difficult, however, to determine actual population numbers.

As part of the USFWS's recovery plan, parameters were established to facilitate recovery. Although the 1993 Recovery Plan is currently in litigation, the Plan's parameters provide a means to measure changes in the grizzly bear population over time and determine its population recovery ability. Meeting the goals established for these parameters is thought to represent accomplishing a population recovery. The recovery goal for allowable, known human-caused mortality is not-to-exceed 4 percent of the total population estimate and female mortality is not-to-exceed 30 percent of that figure. The population estimate is recalculated annually, therefore fixed numbers which can be misleading, were not used here.

The majority of grizzly bear mortalities since 1974 are attributable to human-related incidents, such as shootings and management control actions. Almost half of the mortality risk is associated with people carrying firearms on National Forests. Known and probable grizzly bear deaths tend to be centered around specific areas in and around Yellowstone Park, such as gateway communities of West Yellowstone, Cooke City, and Gardiner, as well as certain recreational developments, sheep grazing allotments, and other human concentration areas. High mortalities in 1994 and 1995 were in contrast to the declining trend of the previous 10 years.

Study Area - Grizzly Bear Management Unit

The study area is within Management Situation 1 (USFS, September 1984, P. 4), grizzly bear habitat and is adjacent to Yellowstone NP and the Absaroka Beartooth and North Absaroka Wilderness areas. The area around Cooke City

townsite is considered to be Management Situation 2. The Management Situation 1 grizzly bear habitat within the study area is under utilized by grizzly bears because of the present levels of human activity and past levels of bear mortality. The Cooke City area is considered to be a population sink for the grizzly bear (Knight, et al. 1988, P. 121), but the remainder of the study area is not. The cumulative effects boundary for grizzly bear for this analysis is Lamar Subunit #1 and #2, and Crandall/Sunlight Subunit #1, #2 and #3, Grizzly Bear Management Unit (BMU) which includes the study area (Tyers, 1996; Figure 24) and a portion of Yellowstone National Park.

Population Level or Demographic Responses. The number of conflicts between grizzly bears and humans is positively correlated with levels and types of human use as it changes seasonally or among years, especially in areas where human activity is unregulated and/or where the bear population is protected from hunting. The number of human-caused grizzly bear mortalities is positively correlated both spatially and temporally with increased human access and activity, and the resulting increased contact between bears and humans.

Mortality/Habituation. Habituated or food-conditioned grizzly bears are much more likely to be killed by humans than bears that remain wary, especially where human activity is relatively unregulated and/or hunting is allowed. Conversely, survival of habituated bears is relatively high in more remote but un hunted areas where human activity is highly controlled, such as National Parks.

Habituated bears are proportionately most active and most common near human facilities such as roads, viewing areas, and recreational developments, especially in un hunted populations. Grizzly bears under-use areas near roads, campsites, cabins, and town-sites in proportion to the habitat available.

Habituated bears are more vulnerable to hunting and poaching and therefore, are often perceived to be a threat to human safety; they are typically killed at a higher rate than wary bears. Thus, habituation typically increases mortality risk for individual bears, except where human activity is closely regulated and the bear population is un hunted. Ungulate hunters accounted for a large portion of defense-of-life-and-property kills in several study areas including the Yellowstone ecosystem since 1988.

Denning Habitat. Continent-wide, the grizzly bear shows a strong fidelity to denning areas. Grizzly bears in dens are relatively tolerant to disturbances beyond 1 km. Denning areas represent locations where bears concentrate their activities. Denning habitat is not considered to be a factor limiting grizzly bears in the Yellowstone area. Suitable

grizzly bear denning habitat exists on high elevation slopes containing dense conifer cover within and around the study area. These areas include, but are not limited to portions of Republic, Woody, Hayden Creek, Cache, Soda Butte to Lamar Valley, Fisher, and Lady of the Lake Creeks (per. comm, Dan Tyers, USFS, Sept. 10, 1996). Denning habitat is not suitable in the area north of Cooke City where logging and fire have removed cover and the road density is high (Tyers, D. Jan. 16, 1997). Additional site specific information on denning habitat is contained in Tyers, 1996.

Hiding and Security. The study area, in contrast with the surrounding area, has a high road density and high levels of human use. In addition, the quality of the hiding and security cover varies throughout the study area because of past fire and timber harvesting events.

Core Areas. The analysis of effects to grizzly bear habitat is, in part, based on an assessment of impacts to core areas. Core areas are defined as areas where (1) no motorized use of roads and trails occurs during the non-denning period, and restricted roads require closure devices that are permanent; (2) no roads or trails exist that receive non-motorized, high intensity use as defined in established cumulative effects activity definitions; and (3) a minimum of 0.3 miles (500 m) exists from any open road or motorized trail. Refer to Map 3-17 for the location of core areas, open roads, and high use trails in the study area.

The bounds of core areas change seasonally, primarily due to seasonal trail use involving hiking, skiing or hunting activities. The time of year that core areas are generally the smallest varies considerably. Often elevation influences access and the type of recreational activity that may be occurring during that season. The seasons are spring from 3/1 through 5/31, summer from 6/1 through 8/31, and fall from 9/1 through 11/30. During the denning season, from 12/1 through 2/29, bears are generally not active. During the spring, at the high elevations in the Cooke City area, skiing is the primary form of recreation. During the summer, hiking is the major recreation. During the fall, hunting outside the Park influences trail use while hiking continues to influence trail use in the Park.

Seasonal core area changes are primarily due to trails going from low use (less than 20 parties/week) to high use (equal to or more than 20 parties/week) from hiking, skiing or hunting activities (Figure 10). Use in Crandall/Sunlight #1 is highest in the summer and lowest in the spring due to the increase in hiking activity that occurs in this area in the summer. Use in the Crandall/Sunlight #2 and #3 appears to be fairly consistent throughout the year with a fairly small change in core through the seasons. Core area in the Lamar #1 subunit is smallest in the summer because the highest use of trails is by summer hikers. A small decrease in core area

occurs in Lamar #2 in the summer. The Lamar #2 subunit is the most isolated and receives the least human use of the five subunits being considered in this analysis.

Food/Prey Base of the Grizzly Bear. Grizzly bears are opportunistic feeders that use a wide variety of animal and vegetal food items. Although diet varied as much by season as by month, trends are discernible. The main items in the diet of Yellowstone grizzly bears are whitebark pine nuts, graminoids, and ungulates. Ungulate meat is estimated to be one of the top two sources of energy in the average diet. Carrion scavenged from March through May can constitute a major portion of this ingested meat.

The whitebark pine component of forests has limited distribution in Montana and is in a declining trend due to stand maturity, susceptibility to pests and the presence of non-native pathogens such as white pine blister rust. Whitebark pine is generally less common and provides better forage habitat for grizzly bear and other wildlife than other forest types in the study areas. Whitebark pine seeds are an important food of grizzly bears and the use of this food by bears is positively associated with fecundity and survival of the population. Use of pine seeds by grizzlies is almost entirely contingent upon the presence and behavior of red squirrels. During most years, virtually all (97%) pine seeds used by grizzly bears is a result of excavations in middens for the otherwise indehiscent cones cached there by squirrels. The 26,160 acre study area contains approximately 2,340 acres of mature and 50 acres of non-mature whitebark pine forest. Whitebark pine forests within the study area are located at high elevations including areas within high elevation mining claims. Relatively few acres of whitebark pine burned in the 1988 fires.

Ungulates are especially important in the diet during March, April, May, September, and October. Diets of grizzlies in the northern mountains and valleys immediately west of the study area are characterized by large volumes of pine nuts and ungulates and relatively low volumes of graminoids than in other regions of the Yellowstone area.

Primary animal food sources (ungulates and rodents) are elk, bison, moose, pocket gophers, and voles. Use of these foods helps explain patterns of grizzly bear distribution and cover type selection. Ungulates are an important food source for grizzlies that potentially range in and around the study area.

Ungulates are used when they are most available and vulnerable, such as winter kill or weakened animals during the spring, calves during May and June, or weakened bulls during the fall rut. A few grizzlies have learned to kill adult elk during the summer. Long-term trends in bear food habits in the Yellowstone area have been influenced by

climatic fluctuations and changes in management of fish and ungulate populations.

Grizzly bear use of the ungulate prey base in the Yellowstone area may change now that wolves have been reintroduced. Currently, grizzlies have almost exclusive use of bison carcasses because their hides are too tough for other scavengers to penetrate. Presumably, wolves will be able to open bison carcasses, and thus could compete with grizzly bears for winter-killed bison. Determining the impacts of wolves on grizzly bear prey base is difficult, because, at this point, the number of wolves that the Yellowstone area can support, their distribution, and their effects on the prey base are conjectural. The changes in ungulate habitat are discussed under each species later in this analysis.

Snow Plowing. Portions of U.S. 212 and WY 296 pass through moose, elk, and mule deer winter ranges. Vehicle collisions with big game animals is typically minimal during the winter months because snow is not plowed from the highways and motor vehicle use is limited to snowmobiles. Snow conditions on unplowed segments of secondary roads typically limit large ungulate access to higher elevations in the study area during the winter. Vehicle collisions with game animals along unplowed roads result in minimal big game carrion sources and minimal attractants to grizzly bears.

Gray Wolf (Nonessential Experimental Population)

Historically the former range of the Northern Rocky Mountain subspecies of the gray wolf extended from Canada into the northern two-thirds of Wyoming. In the early days of Yellowstone National Park, there was a government-sponsored program to eliminate wolves. Nationally the interest was to preserve livestock, but locally this was done in deference to ungulates. In recent years, gray wolves have been reported in the Yellowstone Park area, but sustained pack activity in the vicinity has not been documented for years. At this time there is no ongoing pack activity in the vicinity of the study area, though wolves may occasionally pass through the study area (pers. comm., Joe Fontane, USFWS, October 28, 1996 and January 22, 1997). As of January 1, 1997, at least three wolf packs reside in the Lamar Valley in Yellowstone NP just west of the study area (pers. comm., Mary Hektner, Yellowstone N.P., NPS, Jan. 14, 1997).

The Yellowstone Ecosystem has been designated as a recovery area for the gray wolf. It has been estimated that Yellowstone National Park's northern winter range could support about 75 wolves or about nine packs. The Park could also overlap with the territories of an additional three to four packs. The project area could include portions of one

or more territories of these packs.

Recent reintroductions of the gray wolf in Yellowstone National Park raises the potential of possible project effects on wolf populations. According to 50 CFR Part 17 (November 22, 1994), the reintroduced wolves in Yellowstone National Park are classified as a "nonessential experimental" population according to Section 10(j) of the Endangered Species Act (ESA). "Nonessential experimental" animals located outside national wildlife refuges or national park lands are treated for purposes of Section 7 of the Act, as if they were only proposed for listing" (50 CFR Part 17). In other words, although the wolf is an endangered species, it is treated on National Forest lands as if it were proposed for listing. According to 50 CFR Part 17, "there are no conflicts envisioned with any current or anticipated management actions of the Forest Service or other Federal agencies," and management of wolves in the experimental population would not cause major changes to existing private or public land use restrictions. Land use restrictions on public lands could be used, however, to control human intrusion of den sites when fewer than six breeding pairs exist within the experimental area.

Gray wolves are wide-ranging and their distribution is tied primarily to that of their principal prey (elk, bison, moose, etc.). Key components of wolf habitat are considered to be: "(1) a sufficient, year-round prey base of ungulates (big game) and alternate prey, (2) suitable and somewhat secluded denning and rendezvous sites, and (3) sufficient space with minimal exposure to humans." Key summering areas for ungulates, especially elk, are considered to be of particular importance in managing for wolf recovery. During winter periods, deer, elk, and moose continue to represent principal prey items for wolves, and wolf distribution is keyed to the winter ranges of these species. In Yellowstone National Park, an established wolf population was predicted to prey on ungulates in the following decreasing order of importance: elk, bison, mule deer, moose, pronghorns, and bighorns. Potential wolf use of the project area would coincide with the presence of ungulates on seasonal ranges.

Bald Eagle (Threatened)

Bald eagles are residents and winter visitors in Yellowstone National Park and the surrounding Yellowstone ecosystem. The Yellowstone ecosystem and the analysis areas lie within the Greater Yellowstone Recovery Zone. Suitable bald eagle nesting habitat might occur within the mineral withdrawal area and powerline analysis areas. Foraging habitat is present, including Lake Abundance. Bald eagles are occasionally seen at the larger lakes during the summer, but there are no known nest sites. Recreational activity at this lake as well as high elevation and late ice-free season

renders this site relatively unsuitable as nesting habitat. Bald eagles may also occasionally wander over the powerline corridor, especially near the Clarks Fork Yellowstone River and in the vicinity of Swamp Lake. Disturbance might occur to bald eagles foraging within the project area and potentially to bald eagle nesting habitat within the powerline corridor. There are currently no ready sources of carrion resulting from ungulates killed on winter range by motor vehicles on highways during the winter months.

Peregrine Falcon (Endangered)

The peregrine's preferred nest site is a rugged, remote cliff (100 to 300 feet in height), usually overlooking water or marshy areas where prey is abundant. Preferred hunting areas include cropland, meadows, river bottoms, marshes, and lakes that attract abundant bird life. Peregrines may travel up to 17 miles from nesting cliffs to hunting areas. Peregrine falcons are considered uncommon in Yellowstone National Park, but nesting has been documented. Recent reintroduction efforts have increased the number of nesting pairs within the Greater Yellowstone Ecosystem. There are abundant suitable cliff nest sites in the project area, but much of the project area is still covered with deep snow during the nesting season and is not considered attractive to nesting peregrines. Dispersing or transient birds may occasionally fly over the study area.

EFFECTS OF IMPLEMENTATION OF THE PREFERRED ALTERNATIVE

The preferred alternative is: Alternative B, Mineral Withdrawal. *Under this alternative 17,760 acres of unclaimed federal land are immediately subject to the mineral withdrawal. If the NWM Agreement is implemented, an additional 4,180 acres of Crown Butte's unpatented mining claims would also be withdrawn. Sixty acres of unpatented mining claims and 2,420 acres of private land remain available for mineral development (Map 2-4). The mineral forecast, which was developed as one possible scenario for analysis purposes (Table 3-2), assumes no mines would be developed and 1 exploration operation is possible. Area of likely mineral development is depicted on Map 2-4.*

Grizzly Bear (Threatened)

Population Level or Demographic Responses

Conflicts and Mortality. There is a decreased risk of higher mortality rates resulting from conflicts between bears and humans as a result of illegal causes or control actions. Due

to the decrease in the risk of grizzly bear mortality from illegal causes, management flexibility will tend to be maintained.

Mortality/Habituation. There is a decreased risk that grizzly bear habituation with humans within the BMU will be lethal to bears. There is a decreased risk of mortality for the population of grizzly bears due to unpredictably dispersed and armed humans.

Denning Habitat. There is a decreased risk that mining related actions may result in direct and indirect impacts to suitable denning habitat in areas currently receiving low levels of human use in the study area. There would be a reduced risk that human activity within denning habitat could cause an increase in bear mortality thus impacting grizzly bear populations. Human caused mortality is considered to be a factor limiting grizzly bear populations.

Hiding and Security. There would be a decreased risk of a decline in grizzly bear hiding and security area. Vegetation clearing for mining related actions is not likely to occur and therefore, would avoid the direct loss of forested habitats. There would be minimal risk of reconstruction or construction of roads thereby avoiding motor vehicle access to previously unroaded areas and the resultant loss of security for grizzly bears. Indirect effects from mining related actions would tend to be avoided.

Motorized Access Route Density. There would be no mining related changes in the miles of open roads and numbers of town-sites or major recreational developments in occupied grizzly bear habitat.

Core Areas. There would be a decreased risk to grizzly bear core areas from mining related actions in and around the study area which could potentially include Lamar Subunit #1 and Crandall/Sunlight Subunit #1 and 2 of the Lamar and Crandall/Sunlight Grizzly Bear Management Unit (Tyers 1996, Figure 24). Core areas would likely remain at about current levels with mining related actions limited to exploration for small mining operations. Interim direction on core areas is likely to be met. At this time, the interim direction is to allow no decrease in core area unless allowed through consultation with the USFWS.

Plan Amendment/Core Areas. There is a decreased risk of increases in road densities from mining related actions sufficient to necessitate an Amendment to the Gallatin Forest Plan.

Change in Non-motorized Trail Use/Core Areas. There is a decreased risk of growth in recreation use and the potential human and bear interactions as a result of mine related population increases, especially in core areas. Acceleration

of the current increasing trend in human use of trails in grizzly bear core (unroaded) areas due to mining activity is unlikely. It is estimated that some low use trails may increase to a high use category in approximately the next 10 years as opposed to almost immediate changes with establishment of a major mine.

Food/Prey Base. There is a decreased risk that mining related activities could reduce the available food/prey base for grizzly bears. Mining related effects to the whitebark pine component of forest are not anticipated. Increased trail use resulting from population increases associated with a mine would not occur.

Powerline/Prey Base. Construction of the powerline corridor would not be necessary without mine development, therefore there is a greatly reduced risk of displaced ungulates. Shifts in the ungulate prey base resulting from other mining related actions would not occur. The risks of effects on ungulates are further discussed under each section on prey species (moose, elk, mule deer, bison) in the EIS.

Powerline/Hunter Access. There would be a decreased risk of ungulate hunter and grizzly bear interaction and resultant bear mortality. Maintenance of secure, unroaded blocks of habitat is an important consideration in the stability of hunted populations of ungulates. There would be a decreased risk that area activities would afford greater vehicle access into previously inaccessible secure areas and increase hunting pressure.

Increased Hunter Numbers. There is a decreased risk that grizzly bear mortality will increase due to human population growth from mining related actions. Harvest of elk and mule deer in the area has never been high and would not be expected to change appreciably.

Snowplowing. There would likely be no snowplowing of previously unplowed segments of U.S. 212 and WY 296 for mining related actions and therefore, no associated change from existing levels of vehicle/big game collisions on winter range for moose, elk, and mule deer.

Yellowstone National Park. Snowplowing of the highway for mining related actions would not occur, therefore there would be no increased risk of human access into the park during the winter by mining related populations. There would be no resulting risk to bears who would be in their dens hibernating. There would be a decreased risk of elevated human caused mortality and of the cumulative effects area becoming a population sink to the grizzly bear.

Conclusion. Alternative B, assuming the NWM Agreement is implemented, would result in no major mines and minimal to no direct impacts to the grizzly bear habitat,

identified prey items (animals or plants) or their habitat as a result of mining related actions. There would be a general avoidance of indirect impacts of mining related actions such as human activity and related disturbance and potentially increased human caused mortality. Indirect impacts are estimated to have minor to no impacts to available grizzly bear food sources. Abandoned mine reclamation activities could result in minor long-term benefits to grizzly bear habitat where vegetation is re-established and moderate in areas where currently high motor vehicle access is reduced. Reclamation activities could also result in local, temporary human disturbance.

Cumulative Effects. The cumulative effects boundary for grizzly bear was previously identified as Lamar Subunit #1 and #2, and Crandall/Sunlight Subunit #1, #2 and #3, Grizzly Bear Management Unit (BMU) which includes the study area (Tyers, 1996; Figure 24) and a portion of Yellowstone National Park. There would be a decreased risk of adverse direct and indirect effects on the grizzly bear and its habitat. Mining is not likely to affect occupied or unoccupied grizzly bear denning habitat; hiding and security cover; core areas; prey base; whitebark pine; and the portion of the BMU within Yellowstone National Park. There would be a decreased risk that past, present, and reasonably foreseeable future actions would result in the creation of a population sink to the grizzly bear and increased human caused mortality. There is an increased probability for compliance with the standards in Gallatin Forest Plan Amendment No. 19. Specifically, there is a reasonable probability of at least maintaining the open motorized access route density at or below the current level, maintaining the total motorized access route density at the current level, and maintaining the amount of core areas at the current level. There is insufficient data to determine what if any change would occur to the magnitude of potential competition between grizzly bears and wolves for prey items such as moose from the cumulative effects of past, present, or reasonably foreseeable future actions, including mining.

Gray Wolf

There would be no disturbance from mining related actions within the study area on federal lands nor related powerlines outside of the study area. There would be no plowing of snow associated with mining related actions, therefore large ungulate movement patterns would not be altered. There would be no increase in vehicle collisions and subsequent ungulate carrion sources for predators. Activities associated with saleable minerals (sand, gravel, building stone) could continue within the study area according to the Forest Plans. These activities would tend to occur at existing pits or quarries.

There would be a reduced risk of past, present, and reasonably foreseeable future actions, including mining related actions, impacting gray wolf pack activities, denning habitat, or principal prey species should future pack activity occur in the cumulative effects area. See related discussion on potential prey of gray wolf under the sections on Moose, Elk, Mule deer and Bison in CCAMW EIS.

Bald Eagle

There would be no direct or indirect disturbance to the bald eagle or its potential nesting or foraging habitat from the proposed action (mineral withdrawal). There would be a reduced risk of past, present, and reasonably foreseeable future actions, including mining related actions, impacting the bald eagle or its potential habitat should currently undetected or future use occur in the cumulative effects area.

Peregrine Falcon

There would be no direct or indirect disturbance to the peregrine falcon or its potential nesting or foraging habitat from the proposed action (mineral withdrawal). There would be a reduced risk of past, present, and reasonably foreseeable future actions, including mining related actions, impacting the peregrine falcon or its potential habitat should currently undetected or future use occur in the cumulative effects area.

DETERMINATION OF EFFECT

The determination of effect are based on Alternative B (mineral withdrawal, with Agreement), discussed in detail below, and summarized in Table E-2. The dermination of

effects was based on the proposed action (mineral withdrawal) and cumulative effects (mine reclamation, increasing recreation use trends, plowing of snow for recreational use, etc.).

Grizzly Bear

There would be no effect on the grizzly bear from mineral withdrawal, but the overall determination of the cumulative effect of the alternative is **Not likely to adversely affect**. If there was a net reduction in the density of roads open to motorized vehicles and increase in core area as a result of mine reclamation actions, there is a possibility that a beneficial effect could result. However, given the programmatic nature of this EIS and uncertainty of specific roads, the cause and effect relationship of road closures is uncertain.

Gray Wolf

There would be no effect on the gray wolf from mineral withdrawal, but the overall determination of the cumulative effect of the alternative is **Not likely to adversely affect**. There is no known pack activity in the area at this time, but wolves could utilize the area at some future date.

Bald Eagle

There is no known nesting or roosting habitat in the area, therefore, the avoidance of impacts would result in **Not likely to adversely affect**.

Peregrine Falcon

There are no known nesting sites or suitable nest habitat in the area, therefore, the avoidance of impacts would result in **Not likely to adversely affect**.

TABLE E-2. FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES PRESENT AND DETERMINATION OF EFFECTS

Common Name	Scientific Name	Federal Status	Expected Occurrence	Determination of Effects ¹
Grizzly bear	<u><i>Ursus arctos horribilis</i></u>	Threatened	Resident	NLAE
Gray wolf	<u><i>Canis lupus</i></u>	Nonessential Experimental	Resident, transient	NLAE
Bald eagle	<u><i>Haliaeetus leucocephalus</i></u>	Threatened	Resident migrant	NLAE
Peregrine falcon	<u><i>Falco peregrinus</i></u>	Endangered	Resident, migrant	NLAE

¹Options in Determination of Effect on Federally listed threatened and endangered species: (1) NE = No Effect; (2) NLAE = Not likely to adversely affect; (3) LTAA* = Likely to adversely affect; and (4) BE = Beneficial effect.

* = Considered a trigger for a significant action.

RECOMMENDATIONS FOR REMOVING, AVOIDING, OR COMPENSATING ADVERSE EFFECTS

None identified.

CONSULTATION/COORDINATION

USFWS

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Charles P. Davis, USFWS (Field Supervisor), Ecological Services, 4000 Morrie Ave., Cheyenne, WY 82001, (307) 772-2374

Mary Jennings, USFWS (Contact for consultation), Ecological Services, 4000 Morrie Ave., Cheyenne, WY 82001, (307) 772-2374 Ext. 32

Others

Dan Tyers, District Wildlife Biologist, Gallatin National Forest, Gardiner Ranger District, P.O. Box 5, Gardiner, MT 59030, (406) 848-7485

Clint McCarthy, Forest Wildlife Biologist, Custer National Forest, 2602 First Avenue North, P.O. Box 2556, Billings, MT 59103, (406) 657-6361

Bob Ralphs, Wildlife (Planning, Appeals, Litigation), USFS, Northern Region Regional Office, Federal Building, 200 East Broadway, P.O. Box 7669, Missoula, MT 59807, (406) 329-3640

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APPENDIX F

USFS MANAGEMENT INDICATOR SPECIES

(Gallatin and Custer National Forests)

Prepared by: Don Sasse, Wildlife Biologist, USFS

INTRODUCTION

Project

An environmental impact statement has been prepared which describes and evaluates the effects on Management Indicator Species (MIS) as listed in the Forest Plans for the Cooke City Area Minerals withdrawal project area. The project area is located within Park County, Montana and includes portions of the Gallatin and Custer National Forests.

MIS Species Present in the Project Area

The MIS identified for the Gallatin Forest Plan (USFS, 1987, P. II-19) and Custer Forest Plan (USFS 1986, p. 18). were considered in the analysis for the CCAMW EIS and are displayed in this appendix (Table F-1 and F-2). No further analysis was considered for species absent from the project area. The MIS species present in the project area are further discussed in the EIS.

CONSULTATION/COORDINATION

For the purpose of comparing alternatives in this analysis, MIS species were assumed to be present where suitable habitat was present, but local surveys were incomplete. The following people were contacted in determining MIS present or absent from the project area.

Gallatin National Forest

Dan Tyers, District Wildlife Biologist, Gardiner Ranger District, P.O. Box 5, Gardiner, MT 59030, (406) 848-7375

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Custer National Forest

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**TABLE F-1. MANAGEMENT INDICATOR SPECIES FOR THE
GALLATIN NATIONAL FOREST, NORTHERN REGION, MONTANA**

Common Name	Scientific Name	USFWS Status	General Habitat Requirements	Project Areas - Existing Habitat, and Need for Further Analysis
Grizzly bear	<i>Ursus arctos</i>	Threatened	Threatened species	Yes
Bald eagle	<i>Haliaeetus leucocephalus</i>	Threatened	Threatened species	Yes
Elk	<i>Cervus elaphus</i>		Big game species	Yes
Wild trout			Cold water fisheries	Yes - see Aquatic Resources Report
Goshawk	<i>Accipiter gentilis</i>	C2	Old Growth dependent species, dry Douglas fir sites	Yes
Marten	<i>Martes americana</i>		Old Growth dependent species, moist spruce sites	Yes

¹Based on Gallatin Forest Plan (USFS 1987, p. II-19). Yes = Considered in analysis, No = No further analysis will be completed.

**TABLE F-2. MANAGEMENT INDICATOR SPECIES FOR THE CUSTER NATIONAL FOREST ,
USFS NORTHERN REGION (R-1), MONTANA¹**

Common Name: Habitat Indicators	Scientific Name	USFWS Status	General Habitat Requirements	Project Areas Existing Habitat, and Need for Further Analysis
Goshawk	<i>Accipiter gentilis</i>	C2	Timber - old growth	Yes
White-tailed deer	<i>Odocoileus virginianus</i>		Timber - dog hair ponderosa pine	Yes
Ruffed grouse	<i>Bonasa umbellus</i>		Timber - aspen	Yes
Western kingbird	<i>Tyrannus vociferans</i>		Timber - open savannah [Ashland RD]	No
Lark sparrow	<i>Chondestes grammacus</i>		Timber - open savannah [Sioux RD]	No
Northern oriole	<i>Icterus galbula</i>		Riparian - tree	Yes
Yellow warbler	<i>Dendroica petechia</i>		Riparian - shrub	Yes
Ovenbird	<i>Seiurus aurocapillus</i>		Hardwood draw (grasslands)	No
Rufous-sided towhee	<i>Pipilo erythrophthalmus</i>		Hardwood draw - shrub (grasslands)	No
Brewers sparrow	<i>Chondestes grammacus</i>		Evergreen shrubs: sagebrush	Yes
Sharp-tailed grouse	<i>Tympanuchus phasianellus</i>		Prairie grasslands	No
Prairie chicken	<i>Tympanuchus cupido</i>		Prairie grasslands	No
Cutthroat trout	<i>Oncorhynchus clarki</i>		Aquatic - cold water	Yes, See Aquatic Biology Report
Largemouth bass	<i>Micropterus salmoides</i>		Aquatic - largemouth bass	No, See Aquatic Biology Report
Key (Major Interest)			Commonly Hunted, Fished, or have Unique Habitat Needs	
Elk	<i>Cervus elaphus</i>			Yes
Mule deer	<i>Odocoileus hemionus</i>			Yes
White-tailed deer	<i>Odocoileus virginianus</i>			Yes
Bighorn sheep	<i>Ovis canadensis californiana</i>			Yes
Pronghorn antelope	<i>Antilocapra americana</i>			No
Golden eagle	<i>Aquila chrysaetos</i>			Yes
Prairie falcon	<i>Falco mexicanus</i>			Yes
Merlin	<i>Falco columbarius</i>			No
Sharp-tailed grouse	<i>Tympanuchus phasianellus</i>			No
Greater Prairie chicken	<i>Tympanuchus cupido</i>			No
Yellowstone Cutthroat trout	<i>Oncorhynchus clarki bouvieri</i>			Yes, See Aquatic Biology Report

¹Based on Custer Forest Plan (USFS 1986, p. 18). Yes = Considered in analysis, No = No further analysis will be completed. Also includes Federally listed threatened and endangered species.

GLOSSARY

Abundance and density - The total number of organisms of a type (e.g., total number of fish) inhabiting an area or found in a sample.

Acid Rock Drainage - Leaching from mining wastes, fill, etc. that results from production of mine water which contains free sulfuric acid, mainly due to the weathering of iron pyrites; where sulfide minerals breakdown under chemical influence of oxygen and water, the mine drainage becomes acidic and corrosive. A particular combination of sulfides, oxygen, iron bacteria (*Thiobacillus ferrooxidans* to sustain the reactions) and pH, must be present for acid conditions to be produced. Therefore, not all situations of exposed and weathering iron pyrite will produce acid rock drainage. (See more complete definition in water quality section.)

Active fault - A fault where movement is evident within the Holocene Period (~10,000 years before present).

Acutely toxic and acute toxicity - Concentrations of a chemical that kill 50 percent of organisms after a short-term exposure duration (generally 96 hours or less).

Adsorption - The adherence of molecules in solution to the surface of solids with which they are in contact.

Affected Environment - The biological, social, economic, and physical environment that will or may be changed by proposed actions.

Alluvial - Unconsolidated rock materials, including clay, silt, sand, and gravel, deposited by flowing water.

Aquatic - Related to the water and wetted environment associated with flowing and standing surface waters (lakes, streams, rivers, and reservoirs).

Aquatic Ecosystem - A stream channel, lake or estuary bed, the water itself, and the biotic communities that occur therein.

Aquifer - A formation or group of geologic formations that contains sufficient saturated permeable material to yield water to wells or springs. An aquifer is either confined or unconfined.

Confined - An aquifer which is bounded above and below by beds of distinctly lower permeability.

Unconfined - An aquifer where the water table is exposed to the atmosphere, usually with streamside areas.

Baseflow - A sustained dry weather flow of a stream, derived from ground water.

Bear Management Units (BMUs) - Bear Management Units are areas that are used by land management agencies for grizzly bear habitat evaluation and population monitoring.

Bedding plane - The division plane that separates successive layers or beds in stratified rocks.

Benthic - Related to the near-bottom environment of aquatic environments.

Benthic invertebrate - Communities of insects, worms, clams, and related animals that live in benthic environments.

Best Management Practices (BMP) - A practice or a combination of practices, that is determined by a State (or designated area-wide planning agency) after problem assessment, examination of alternative practices, and appropriate public participation to be the most effective, practical means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals (40 CFR 130.2g).

Best Available Control Technology (BACT) - The best available air pollution control technology for a given purpose as stipulated by the Environmental Protection Agency (EPA).

Big Game - Those species of large mammals normally managed as a sport hunting resource.

Bioaccumulate and bioaccumulation - Tendency of chemicals in the environment to enter into organisms through their food or water where the chemicals remain and accumulate in tissues to concentrations potentially greater than found in the environments inhabited by the organisms.

Biodiversity - Variety of life and its ecological process.

Biological Evaluation (BE) - A documented review of all Forest Service planned, funded, executed or permitted programs and activities for possible effects on endangered, threatened, proposed or sensitive species. A biological evaluation may be used or modified to satisfy consultation requirements for biological assessment of projects requiring an Environmental Impact Statement.

Biological Opinion - An official report by the US Fish and Wildlife Service (FWS) issued in response to a formal Forest Service request for consultation or conference. It states whether an action is likely to result in jeopardy to a species or adverse modification to its critical habitat.

Biotica - All the natural living organisms in a planning area and their life processes; b. Refers to living components of an ecosystem, e.g., plants and animals; c. Of non-living organisms in their ecological rather than their physiological relations; d. Pertaining to any aspect of life, especially to characteristics of entire populations or ecosystems.

Candidate species - These species are designated by the U.S. Fish and Wildlife Service as being candidates for listing as threatened and endangered under the Endangered Species Act.

Catastrophic natural forces - Forces resulting from natural occurrences (such as earthquakes and floods) that are of a magnitude that usually results in severe damage.

Chronically toxic and chronic toxicity - Concentrations of a chemical in water that kill organisms after long-term exposure (often months).

Class II - This class is intended to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

Class III - This class is intended to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

Class IV - This class is intended to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the effect of these activities through careful location, minimal disturbance, and repeating the basic elements.

Closure - The administrative order that does not allow specified users in designated areas or on Forest development roads or trails.

Coarse fragment content - The volume of the soil greater than 2mm in size. If the coarse fragment content is greater than 50% by volume, the lead agencies consider it unsuitable for salvage unless soil materials are limited in the area.

Code of Federal Regulations (CFR) - Regulations developed at the Department level for the specific implementation of a Public Law. For example, 36 CFR 228 are the implementing regulations for the Federal Onshore Oil and Gas Leasing Reform Act of 1987 (FOOGLRA).

Community - A group of populations living and interacting over a given area.

Consumptive use - A use of resources, such as water, which permanently reduces the supply.

Contributing site - Any historic property that contributes to the significance of a Historic District.

Cooperating agencies - Federal and State agencies (other than the lead agencies) that have jurisdiction by law or have special expertise with respect to the proposed action.

Core Ranges (Big game) - Those portions of home ranges of animals that receive disproportionately high seasonal use and therefore are deemed key habitat for the herd.

Corridor - An area through which species can move from one place to another over time in response to changes in environment or as natural parts of their history..

Cost - The negative or adverse effects of expenditures resulting from an action. Costs may be monetary, social, physical, or environmental in nature.

Cover - Vegetation used by wildlife for protection from predators, or to ameliorate conditions of weather, or in which to reproduce.

Cultural Resources - The physical remains of human activity (artifacts, ruins, burial mounds, petroglyphs, lithic scatters, etc.) and conceptual content or context (as a setting for legendary, historic, or prehistoric events, as a sacred area of native peoples, etc.) of an area of prehistoric or historic occupation.

Cumulative Effect - The impact on the environment which results from the incremental impact of the action when added to other actions. Cumulative impacts can also result from individually minor but collectively significant actions taking place over a period of time.

Degradation of water - A change in water quality that lowers the quality of high-quality waters for a parameter.

Reductions in mean monthly streamflow in excess of 15 percent are also considered to be degradation. Changes in water quality that are considered not to be significant are established by the Montana Department of Environmental Quality.

Detection limit - The minimum concentration of a substance that can be identified, measured and reported with 99 percent confidence that the concentration is greater than zero.

Dispersed Recreation - That portion of outdoor recreation use which occurs outside of developed sites in the unroaded and roaded Forest environment, (i.e. hunting, backpacking and berry picking).

Displacement - As applied to wildlife, forced shifts in the patterns of wildlife use, either in location or timing of use.

Dissolved metals - Metals that are in solution and metals that are attached to very small floating particles.

Distance zones - The distance between a viewer and what is being viewed. Distance zones are typically described as foreground, middleground, or background.

Foreground - 0.25 to 0.5 miles (individual boughs of trees form textures)

Middleground - 0.5 to 3 to 5 miles (masses of trees form textures)

Background - 3 to 5 miles to the horizon line (tree stands appear uniform and texture cannot be discerned)

Diversity - The distribution and abundance of different plant and animal communities and species within the area covered by a land and resource management plan.

Diversity - (Alpha, Beta, Gamma) - Reed Noss (1983) discusses three scales of diversity; alpha, beta, and gamma. Alpha diversity deals the number of species within a single habitat or community. Beta diversity addresses the change of species along a series of habitats. Gamma diversity is the species diversity of a large geographic region.

Employment-direct - The total number of employees or contractors employed for construction and operation of a project or projects.

Employment-indirect - The employment created by the additional demand for goods and services resulting from the project and its immigrating population.

Endangered Species Act - A federal act to provide protection and conservation for threatened or endangered species.

Eocene - The second of the five major epochs of the Cenozoic era, characterized by the rise of mammals.

Ephemeral Stream - A stream that flows only in direct response to precipitation and whose channel is at all times above the water table.

Exotic Species - Species which occur in a given place, area, or region as the result of direct or indirect, deliberate or accidental introduction of the species by humans, and for which introduction has permitted the species to cross a natural barrier to dispersal.

Erodibility - A rating of the relative susceptibility of exposed soil to erosion by water or wind.

Existing visual condition - The level or amount of modification from a naturally-appearing landscape.

Existing visual character - A general description of a visual environment in terms of landform, rock formations, water forms, and vegetative patterns often described in terms of line, form, color, and texture relative to the surrounding landscape.

Fault - A fracture along which there has been displacement of the sides relative to one another.

Fen - A peat wetland that is fed by ground water.

Poor fen - A peat wetland that receives ground-water flow and achieves productivity intermediate between that of a rich fen and an ombrotrophic bog.

Rich fen - A highly productive peat wetland often dominated by grasses or trees in contrast with shrubs and mosses.

Ferricrete - Deposits of sand and gravel cemented into a hard mass by iron oxide.

Fine sediment - Particles carried in the water and deposited on lake and stream bottoms that are less than 6.3 millimeters (mm) in diameter and, when present in excess, can cause marked degradation of aquatic habitats.

Floodplain - Level area near a stream or river, constructed by a river in its present climate and overflowed during moderate flow events, usually defined as a 100-year recurrence interval flood.

Forage - All browse and nonwoody plants available to livestock or wildlife for feed.

Forb - Herbaceous plant that is not a grass or grass-like, which usually has showy flowers, such as dandelion.

Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA) - The parent act that preceded Forest Planning. This act directed that the National Forest System begin systematic resource planning on the National Forest units.

Forested Areas - Areas having at least 10 percent of the stand covered by trees, and those trees having at least 10 percent crown coverage.

Forest habitat type - The classification of vegetation types used to group forest vegetation by dominant species and basic ecological subdivisions (overstory, herbaceous and shrub undergrowth). All land areas potentially capable of producing similar plant communities at climax may be classified as the same habitat type. A climax habitat will develop on a site if not disturbed by fire, logging or other major disturbance.

Forest Plan standard - A criterion set by the Forest Service to meet resource goals; for example, a 30 percent old growth standard for certain management areas.

Fracture - A crack, joint, fault or other break in rocks.

Fragmentation - Breaking up of contiguous areas into progressively smaller patches of increasing degrees of isolation. \6. Opposite of connectivity.

Game Species - Any species of wildlife or fish for which seasons and bag limits have been prescribed under State or Federal Laws, Codes and Regulations, and which are normally harvested by hunting, trapping, and fishing.

Geology - The study of the planet Earth. It is concerned with the origin of the planet, the material and morphology of the Earth, and its history and the processes that acted (and act)

Glacial moraine - A mound, ridge, or other distinct accumulation of unsorted, unstratified glacial drift.

Glacial till - Unstratified glacial material deposited directly by a glacier without reworking by meltwater and consisting of a mixture of clay, silt, sand, gravel, and boulders.

Glaciofluvial - Pertaining to meltwater streams flowing from glaciers or to the deposits made by such streams.

Greater Yellowstone Area - Contiguous mountainous area including and surrounding Yellowstone National Park. Because of the confusing terminology and the fact that social and economic needs of people are also important issues, land managers use the term area instead of ecosystem when referring to this region. It is a more appropriate geopolitical definition and recognizes the inexact nature of the boundaries of this special and controversial place.

Grizzly Bear Core Area - An area where no motorized use of roads and trails occurs during the non-denning period, and restricted roads require closure devices that are permanent; no roads or trails exist that receive non-motorized, high intensity use as defined in established cumulative

effects activity definitions; and a minimum of 0.3 miles (500 m) exists from any open road or motorized trail.

Grizzly Bear Population Sink - An area that brings grizzly bears into contact with humans often resulting in removal of bears from the population.

Ground water - Subsurface water in a zone of saturation which is or can be brought to ground surface through springs, seeps, wells or direct discharge to surface flows.

Habitat - A place where a plant or animal naturally or normally lives and grows.

Habitat coefficients - Seasonal values ranking vegetation habitat features on the availability of food and/or cover.

Habitat Indicator Species - Species whose population changes are believed to indicate effects of management on other species of a major biological community or on water quality. The forest will provide for the maintenance and improvement of habitats for these indicator species.

Habitat type - An aggregation of all land areas potentially capable of producing similar plant communities.

Hardness - A property of water due primarily to the presence of calcium and magnesium ions. Aquatic life standards for some metals vary with changes in hardness.

Herbaceous vegetation - Seed producing plants, such as grasses, forbs and sedges, that do not develop persistent woody tissue.

Hiding Cover - Trees or other vegetation of sufficient size and density to conceal animals from view at 300 feet.

Historic - The period after Euroamerican influences entered the study area.

Historic district - A geographic area with a number of related significant historic properties.

Human disturbance zone - An area surrounding human activities in which habitat use by grizzly bears is reduced.

Human disturbance coefficients - Values assigned to different activity types and activity duration indicating the degree to which habitat within the zone of influence remains effectively usable by bears.

Igneous - A rock or mineral that solidified from molten or partially molten material, such as magma.

Income-direct - Income earned by direct employees.

Income-indirect - Income earned by indirect employees.

Income-non-earned - Retirement income, transfer payments and investment income.

Indicator Species - In the Forest Plan, a species of animal or plant whose presence is a fairly certain indication of a particular set of environmental conditions. Indicator species serve to show the effects of development actions on the environment.

Indigenous Species - A species which originally inhabited a particular National Forest or National Grassland (see definition of exotic).

Indirect Effects - Indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Infrastructure - The basic facilities and system on which a community depends such as roads, schools, sewer and water systems, and public buildings.

Inferred reserve base - The in-place part of an identified resource from which inferred reserves are estimated. Quantitative estimates are based largely on knowledge of geologic character of a deposit, and for which there may be no samples or measurements. The estimates are based on an assumed continuity beyond the reserve base.

Immigrants - Employees or contractors and their families who move into the study area to take jobs.

Interior Habitat - That portion of an ecosystem or a fragment that is far enough removed from its outside boundaries so as not to be significantly influenced by edge effects. The width of the zone effected by the edge, and accordingly, the core of the interior habitat, will vary with the composition and structure of the ecosystem and the requirements of the species being considered. Species that require specific attributes of interior habitats are often referred to as interior species.

Intensive inventory or Survey - A pedestrian survey of 100 percent of an area to be impacted by a proposed undertaking. The goal of the inventory is to identify and evaluate all prehistoric and historic sites in the study area.

Intermittent Stream - A stream that flows only a certain times of the year when it receives water from springs or from some surface source such as melting snow.

Interdisciplinary Team (ID Team) - A group of individuals with different training assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad to adequately solve the problem. Through interaction, participants bring different points of view to bear on the problem.

Intrusive - Igneous rock that is forced into pre-existing rocks while still in a liquid state (magma).

Issue - A point of discussion, debate, or dispute about environmental effects.

Isolated find - Location of a few (less than 5) historic or prehistoric artifacts.

Joint - Surface of fracture or parting in a rock, without displacement.

Key observation points - For analytical purposes, key viewing locations used to determine the visibility of features or objects.

Lacustrine - Any wetland situated in a topographic depression lacking trees, shrubs, persistent emergents, emergent masses or lichens with greater than 30% aerial coverage.

Laramide - A time of mountain building in the eastern Rocky Mountains, extending from the late Cretaceous through the Paleocene. Intrusive rocks and accompanying ore deposits were emplaced at that time.

Lead agencies - Agencies having the responsibility for preparing an EIS. The U.S. Forest Service and the Bureau of Land Management are the lead agencies for the proposed Cooke City Area Mineral Withdrawal EIS.

Load or loading - The total weight of a compound that a stream transports over a given time period. Loading is determined by multiplying flow by concentration.

Local hires - Employees or contractors associated with a project who already reside in the study area when hired.

MPDES Permit - Montana Pollution Discharge Elimination System Permit for point (usually a pipe) discharge to a stream, lake, or groundwater. Administered by the Montana Department of Environmental Quality - Water Protection Bureau.

Magnitude of physical change - A relative qualitative or quantitative measure of the amount or size of visual alteration.

Management area - Areas of National Forest System lands that have common management direction and which may not be contiguous in the forest.

Maximum modification - Human activity may dominate the characteristic landscape, but should appear as natural when viewed as background.

Metamorphic - Rock derived from pre-existing rocks by mineralogical, chemical and/or structural changes, essentially in the solid state, in response to changes in temperature, pressure, shearing stress, and chemical environment.

Mine Inflows - Ground water that flows into mine openings or mine portals.

Mineral entry - The filing of a mining claim on federal land to obtain the right to mine any locatable minerals it may contain. Also the filing for a mill site on federal land for the purpose of processing off-site locatable minerals.

Mineral exploration - The search for valuable minerals.

Mineralization - The process by which a mineral or minerals are introduced into a rock.

Mitigation - Any method used to lessen the adverse effect of a proposed impact. Mitigation means avoiding actions or protecting resources where practical, but mitigation for significant historic and prehistoric sites can include data recovery through excavation, photography, archival research, re-analysis of existing collections, and oral interviews. Data recovery is intended to provide a record of the site and the information it contains even though the site would be subsequently destroyed or altered.

Modification - Human activity may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in middleground or background.

Morainal deposits - A mound or ridge of unstratified glacial materials deposited by direct glacial action.

National Forest Management Act - A law passed in 1976 as amendments to the Forest and Rangeland Renewable Resources Planning Act that requires the preparation of Regional and Forest plans and preparation of regulations to guide that development.

National Forest System - Includes all National Forest System lands reserved or withdrawn from the public domain of the United States; all National Forest System lands acquired through purchase, exchange, donation, or other means; the national grasslands; and land utilization projects administered by the Forest Service under Title FCCIII D of the Bankhead-Jones Farm Tenant Act of 1937.

National Register of Historic Places - A recorded list of significant cultural historic and prehistoric sites in the United States. The National Register of Historic Places (NRHP) was created by the National Historic Preservation Act. Sites listed on the NRHP are entitled to specified levels of protection from any undertaking that may damage the site.

Neotropical migrant - Migratory birds that have their winter habitat in southern latitudes (tropics) and their summer or breeding habitat in northern latitudes.

Nongame - Species of animals which are not managed as a sport hunting resource.

Noxious weeds - A legislated classification of undesirable plants that are of local concern due to their potential impacts such as reduced agricultural production and potential to displace native vegetation. Noxious weeds are generally not native to the local area.

Nutrient - Total inorganic phosphorus and total inorganic nitrogen.

OHV - Off-highway vehicles (4x4 high clearance vehicles, snowmobiles, ATVs, motorcycles).

Old growth forest - Individual trees or stands of trees that are past full maturity and showing a high degree of decadence. Old growth forests are considered ecosystems that are distinguished by old trees and related structural attributes. They encompass the later stages of stand development that typically differ from earlier stages in characteristics such as tree age, tree size, number of large trees per acre and basal area. In addition, attributes such as decadence, dead trees, the number of canopy layers and canopy gaps are important but more difficult to define.

pH - A numerical measure of reactivity of hydrogen ions in soil or water. A neutral pH is 7.0; pH values greater than 7.0 are alkaline and values below 7 are acid.

PM10 - Particulate matter less than 10 microns in diameter.

PSD - Prevention of Significant Deterioration permit administered by the Montana Department of Environmental Quality - Air and Waste Management Bureau. PSD permits are required for new sources of air pollution in order to restrict emissions to specified increments where air quality is already better than required to meet primary and secondary ambient air quality standards.

Paleozoic - The earliest Era of geologic time. Characterized by the appearance of marine invertebrates, primitive fishes, primitive land reptiles, and land plants. Ranged from 570 million years to 225 million years ago.

Palustrine - Non-tidal wetland of a class dominated by trees, shrubs, persistent emergents, or emergent mosses or lichens.

Partial Retention - Human activities may be evident, but most remain subordinate to the characteristic landscape.

Patented mining claim - A former unpatented claim to which the U.S. has issued a document conveying ownership and title of both surface and mineral estates to a private party.

Perennial Stream - A stream that flows continuously year round.

Periphyton - Communities of soft-bodied algae and diatoms that live in benthic environments.

Permeability - The property of porous rock, soil or sediment for transmitting water; a measure of the relative ease of fluid flow under unequal pressure.

Phanerozoic - That part of geologic time represented by rocks in which the evidence of life is abundant.

Pleistocene - The geologic epoch characterized by the alternate appearance and recession of glaciation, the "Ice Age".

Population - A group of individuals of any one kind of organism living and interacting over a given area.

Population immigration - All the sum of immigrating employees (direct and indirect), as well as their spouses and children of these employees.

Precambrian - The oldest and largest division of geologic time. Representing all geologic time before the paleozoic.

Prehistoric - Refers to the Native American past in the study area before Euroamerican influences entered the area.

Preservation - A visual quality objective.

Raptor - Birds of prey, such as owls, hawks, and eagles.

Recharge - The addition of surface water to ground water, such as by precipitation or leakage from streams.

Reclamation - The restoration of surface conditions to prevent erosion and/or promote revegetation of the disturbed area.

Recreation opportunity spectrum - ROS - A framework describing, stratifying, and defining classes of outdoor recreation environments, activities, and experience oppor-

tunities. The settings, activities, and opportunities for obtaining experiences are arranged along a continuum or spectrum divided into six classes; primitive, semi-primitive, roaded-natural appearing, rural and urban.

Rehabilitation - A management objective to restore undesirable visual impacts to the greatest degree possible. Rehabilitation may be achieved through the alteration, concealment, or removal of obtrusive elements.

Relative habitat value - A numerical ranking used in this EIS analysis for assessing the relative effects of each alternative on grizzly bear habitat. Habitat (food and cover) coefficients and human disturbance coefficients were used to calculate relative habitat values.

Reserves - For this EIS, the portion of an identified mineral resource base that meets specified minimum physical and chemical criteria related to current mining and production practices and that can be economically and legally extracted at the time of determination. Quantity is computed from dimensions revealed in rock outcrops, trenches, workings, or drill holes; quality or grade is computed from results of detailed sampling.

Retention - Human activities are not evident to the casual Forest visitor.

Revegetation - The successful establishment of a permanent, self-sustaining stand of vegetation.

Riffle and pool complexes - Riffles are the rapid movement of water over a coarse substrate (rocks) resulting in rough flow, turbulent surface and high dissolved - oxygen levels in the water. Pools are deeper areas associated with riffles (40 CFR 230.45). Pools have slower velocities, a smooth surface and finer substrates.

Riparian areas - Areas with distinctive resource values and characteristics that are comprised of an aquatic ecosystem and adjacent upland areas. This includes floodplains, wetlands, and all areas within a horizontal distance of about 100 feet from the normal high-water line of a stream channel, or from the shoreline of a standing body of water.

Riparian Ecosystem - a) Ecosystems transitional between terrestrial and aquatic ecosystems. Also streams, lakes, wet areas and adjacent vegetation communities and their associated soils which have free water at or near the surface. b) Those assemblages of plants, animals, and aquatic communities whose presence can either be directly or indirectly attributed to factors that are water influenced or related. Interacting system between aquatic and terrestrial situations, identified by soil characteristics, and distinctive vegetation that requires or tolerates free or unbound water.

Riparian Vegetation - Plant species that grow adjacent to streams or other bodies of water, or that require additional moisture to survive and are located in areas with run-in moisture or perched water tables.

Riparian Zone - An area of vegetation adjacent to an aquatic ecosystem. It has a high water table, certain soil characteristics, and some vegetation that requires free (unbound chemically) water or conditions that are more moist than normal. This zone is transitional between aquatic and upland zones.

Roadless Area attributes - Characteristics of a Roadless Area, similar to wilderness characteristics. The Forest Service has established six attributes that are considered in analyzing effects to Roadless Areas—natural integrity; apparent naturalness; remoteness; solitude; special features; and manageability and boundaries.

Natural integrity, apparent naturalness and solitude have the same meaning as wilderness attributes.

Remoteness is a perceived condition of being secluded, inaccessible, and out of the way.

Special features are those unique geological, biological, ecological, cultural or scenic features that may be located in a Roadless Area.

Manageability and Boundaries relates to the ability of the Forest Service to manage a Roadless Area to meet size criteria (generally greater than 5,000 acres) and the other five attributes.

Runoff - Water that flows over the soil surface from areas that are impervious, locally saturated, or areas where the rainfall rate exceeds the infiltration capacity of the soil.

Scenic Integrity - State of naturalness, or conversely, the state of disturbance created by human activities or alteration. Integrity is stated in degrees of deviation from the existing landscape character in a national forest.

Scoping - The process of explaining the proposed action, identifying issues related to the proposed mineral withdrawal, and reasonable alternatives that are to be analyzed in depth in an Environmental Impact Statement

Sedimentary - Rocks formed by the deposition and consolidation of sediment.

Sedimentation - The process of deposition of clay, sand, gravel and/or organic fragments that have been transported by water or wind.

Sediment yield - The increased deposition, in tons per year, of solid fragmental material into area streams due to increased soil erosion.

Seismic - Of or pertaining to earthquakes.

Sensitive species - Those plant or animal species which are susceptible or vulnerable to activity impacts or habitat alterations and will be managed similar to threatened or endangered species. The Forest Service policy is to ensure that species would not be affected in such a manner as to have them listed or proposed for listing as threatened or endangered.

Seral stage - Series of transformations from one vegetation community to the next.

Significant cultural resources - Prehistoric and historic sites that have been evaluated as eligible for nomination to the NRHP.

Site, cultural - Location of structures, features (such as, but not limited to, archeological pits, hearth, and walls), and historic and/or prehistoric artifacts.

Special aquatic sites - Sanctuaries and refuges, mud flats, vegetated shallows, coral reefs, pool and riffle complexes and wetlands (40 CFR 230.45).

Species - A population or series of populations of organisms that are capable of interbreeding freely with each other but not with members of other species.

Split Estate - A term that refers to different ownership of the surface and subsurface properties. For example, the Federal government may own the surface and a private person or persons may own the minerals underlying the parcel.

Soil association - A soil mapping unit in which two or more defined soil taxonomic units occur together in an individual and characteristic pattern over a geologic region.

Soil complex - A mapping unit used in soil surveys where two or more defined taxonomic units are so intimately intermixed geographically that it is impractical to separate them.

Soil survey - A general term for the systematic examination of soils in the field and laboratory. Soil surveys provide a description and classification of map units, as well as interpretations for various uses or management.

Soil taxonomic name - A classification of soils based on their characteristics. Taxonomic names are similar to scientific names used for biological classification of plants and animals.

Stock - A body of intrusive igneous rock less than 40 square miles in surface exposure.

Stormwater Discharge Permit - Permit required for non-point discharges of sediment and other pollutants by controlling source sites affected by infrequent storm discharge. Administered by the Montana Department of Environmental Quality - Water Quality Division and includes construction projects that will disturb more than 5 acres, more than 1 acre if the site is within 100 feet of a stream.

Stratovolcano - A conical-shaped volcano composed of ash and lava deposited in alternating layers.

Subsoil - The subsurface layers of mineral soil with varying degrees of organic matter accumulation, textural differences (i.e., clay accumulation) and other properties developed as a result of the soil formation process. These subsoil layers are identified as a resource to aid in the reclamation process if soil disturbance must occur. They can be used as part of the growth medium as well as providing distinct engineering properties to aid in drainage or limiting seepage and infiltration of water, etc.

Suitable forest land - Forest land (as defined in CFR 219.3) for which technology is available that will ensure timber production without irreversible resource damage to soils, productivity, or watershed conditions; for which there must be reasonable assurance that such lands can be adequately restocked (as provided in CFR 219.14); for which there is management direction that indicates timber production is an appropriated use of the area.

Tailings - Ground-up rock from which marketable minerals have been removed by milling.

- * **Pyrite** - A naturally-occurring mineral (iron disulfide) with a bright metallic luster. Called "fools gold." Can produce sulfuric acid over time when exposed to air and water. Pyritic tailings refers to tailings containing pyrite and other minerals.
- * **Dewatered tailings** - Tailings from which some water has been removed. Dewatered tailings would have about 20 percent moisture, similar to moist clay.

Talus - Fragments of rock and other soil material.

Terrestrial Ecosystem - A land based ecosystem. An interacting system of soil, geology, topography with plant and animal communities.

Tertiary - The first period of the Cenozoic Era. Characterized by the appearance of modern flora and large mammals. From 65 million to 2 million years ago.

Threatened, Endangered and Sensitive Species (TES) - Any species, plant or animal, which is likely to become a

threatened or endangered species within the foreseeable future throughout all or a significant portion of its range. Threatened species are identified by the Secretary of the Interior in accordance with the 1973 Endangered Species Act.

Timber compartments - Areas within the Forest established to manage the land and resources.

Total Dissolved Solids - TDS - Summation of anions and cations dissolved in water.

Total recoverable metals - That portion of a water and suspended sediment sample measured by the total recoverable analytical procedure described by the U.S. EPA in "Methods for Chemical Analysis of Water and Wastes," 1979.

Traditional cultural properties - Properties that play a role in living or modern communities historically rooted beliefs, customs, and practices.

Topsoil or native surface soil - The surface layers of organic matter accumulation and mineral soil found in soil profiles resulting from the soil formation process. The surface layer is often a valuable resource to aid in the reclamation process especially if it can be handled as a separate layer and replaced on top of a reclaimed surface. Topsoil replacement has become a standard operating procedure for most soil disturbing activities including highways, mining and general construction.

Unpatented mining claim - A geographic area of public lands in which an individual, by the act of valid location under the mining laws, has obtained a right to remove and extract minerals from the land, but where full title has not been acquired from the U.S. Government. The maximum size of a lode claim is 600 x 1500 feet (approximately 20 acres) and the maximum size of a placer claim is 20 acres.

Valid Existing Rights - Mining claims have valid existing rights if a discovery was made on the claim prior to the date of withdrawal from mineral entry. "A mining claimant must make a discovery of a valuable mineral deposit within the limits of a mining claim as a prerequisite to a valid location. A discovery exists where minerals have been found on the claim which are of such a character that a person of ordinary prudence would be justified in further expenditure of his labor and means with a reasonable prospect of success in developing a valuable mine. This prudent person test has been refined to require a claimant to show that the mineral is "marketable", that is, that it can be extracted, removed, and marketed at a profit.

Variety class - A particular level of visual variety or diversity of landscape character.

Vegetation types - Existing plant communities with distinguishing characteristics, typically dominated by one or two species, which are used to name the vegetation type.

Viability - The likelihood of continued existence in an area for some specified period of time.

Viewer sensitivity - The degree or measure of viewer interest in the scenic qualities of a landscape. Viewer sensitivity is often closely associated with the level of visual expectation of the viewer.

Visibility - The level or measurement of the ability to see a feature from a particular view point or view points. Usually measured in distance called Standard Visual Range.

Visual absorption capability - The ability of a landscape to absorb change without being visually evident. Key determinants are typically landform and vegetative diversity, the viewing angle, and slope.

Visual quality - A qualitative term used to indicate the relative attractiveness of a visual resource.

Visual quality objectives - A desired level of scenic quality based on physical and sociological characteristics of an area. Refers to the degree of acceptable alteration of a characteristic landscape. Commonly referred to as VQO.

Watch Species - A plant species, or recognized subspecies or variety which meets the above definition of a sensitive species, but is not presently known to occur on National Forest land in North Dakota. These taxa, are predicted to occur on National Forest land on the basis of suitable habitat. If found on National Forest land, these taxa would immediately be evaluated for placement on the sensitive species plant list.

Water right claim - A claim to use a certain quantity of water for beneficial uses which has not been judicially established as a water right.

Water right - The right to use a certain quantity of water for beneficial purposes.

Watershed - The entire land area that contributes water to a particular drainage system or stream.

Waters of the U.S. - All waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide, all interstate waters including interstate wetlands; all other waters, such as intrastate

lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of which would or could affect interstate or foreign commerce; all impoundments of waters otherwise defined as waters of the United States, tributaries of waters; the territorial sea; and wetlands adjacent to waters [defined above] (33 CFR 328.3). Waters of the U.S. within the project area include springs, seeps and ephemeral drainages, small perennial drainages commonly supported by ground water seeps, large perennial drainages with pool and riffle complexes, small unnamed ponds, and jurisdictional wetlands.

Water Table - The surface of a body of unconfined groundwater.

Wetland functions - Physical, chemical or biological processes or attributes of wetlands that are vital to the integrity of the wetland system.

Wetlands - Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas. (33 CFR 328.3). Jurisdictional wetlands are based on the guidelines and criteria set forth in the Corps of Engineers Wetland Delineation Manual (Environmental Laboratories, 1987). Wetlands are found throughout the project area, and are considered special aquatic sites.

Wilderness attributes-Characteristics of designated and recommended Wilderness. The Wilderness Act directs land managing agencies (the U.S. Forest Service) to protect the natural character of the wilderness and to provide for recreational, scenic, scientific, educational, cultural, and historical uses of wilderness areas. Based on the Wilderness Act's definition of wilderness, the Forest Service describes four requisite attributes of Wilderness-natural integrity; apparent naturalness; outstanding opportunities for solitude; and opportunities for primitive recreation. These attributes are applied to the conditions inside the boundaries of the Wilderness.

Natural integrity is the extent to which long-term ecological processes are intact and operating.

Apparent naturalness is a measure of importance of visitors' perceptions of human impacts to an area.

Solitude is a personal, subjective value defined as isolation from the sights, sound and presence of others, and of the development of man.

Opportunity for primitive recreation includes the opportunity to experience solitude, a sense of remoteness, closeness to nature, serenity, and spirit of adventure.

Wild River - A river segment that has been designated by the U.S. Congress for inclusion into the Wild and Scenic River System because it has characteristics of a wild river. A portion of the Clarks Fork Yellowstone River in Wyoming is a designated Wild River. Wild rivers have four characteristics - free of impoundments; generally inaccessible except by trails; watersheds or shoreline essentially primitive; and waters unpolluted.

Designated river segment - A river segment that has been designated by the U.S. Congress or the Secretary of the Interior as a wild, scenic, or recreational river because of its outstandingly remarkable values.

Eligible river segment - A river or creek segment that has been determined by a land-managing agency, such as the Forest Service, to be free-flowing and possessing at least one outstandingly remarkable value. Several river segments in the withdrawal area are eligible river segments.

Outstandingly remarkable values - Values associated with designated or eligible Wild and Scenic River segments. The Wild and Scenic River Act describes six outstanding remarkable values that Wild and Scenic Rivers may possess - scenic, recreational, geological, fish and wildlife, historical, and cultural.

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